The Welding Engineer

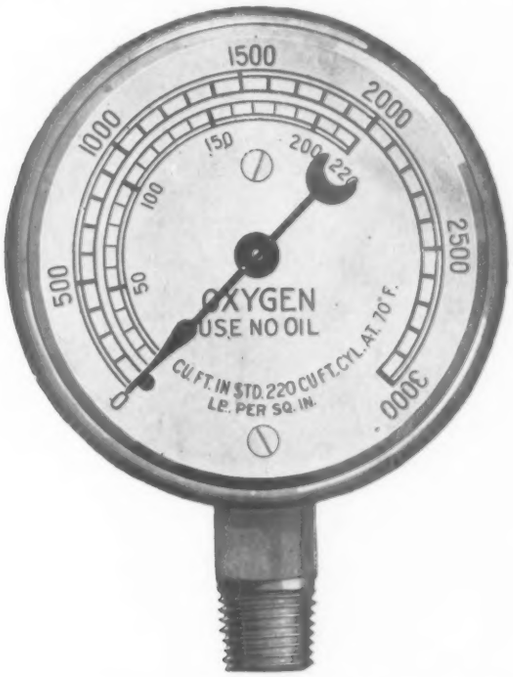
Reg. U. S. Pat. Office

Founded by L. B. Mackenzie, 1916

JUNE, 1929 VOL. 14, NO. 6

$3.00 per year in U. S. 608 S. Dearborn St., Chicago, Ill. $4.00 per year abroad

NATWELD GAUGES



APPROVED by the Underwriters Laboratories, endorsed by the welders who use them, dependably accurate under all service conditions, and remarkably long-lived, Natweld Gauges are nevertheless, remarkably low in price, due to improved production methods and heavy demand.

Represented in Illinois, Indiana, Wisconsin, Minnesota and Missouri
by
Joseph Halla,
333 North Michigan Ave., Chicago, Ill.

National Gauge & Equipment Co.,
820 Tower Court, Chicago.

National Gauge & Equipment Co.,
15 Wilbur Ave., Long Island City, N. Y.

The MotoMeter Co. of Canada, Ltd.,
Hamilton, Ontario

National Gauge & Equipment Co.

La Crosse, Wisconsin

Division of The MotoMeter Company Inc.

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A PROJECTION WELDING APPLICATION AT THE NILES STEEL PRODUCTS CO., NILES, OHIO

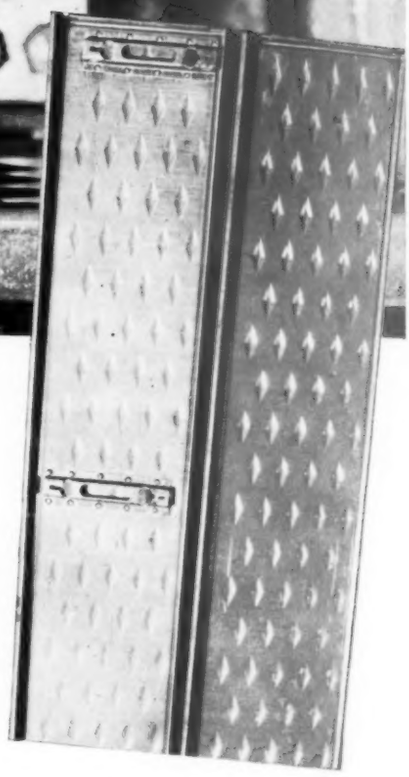
A Resistance Welding Job Made Practical

With *ELKONITE* Dies!

THE application shown here consists of projection welding 3 brackets to a truck running board. Both the brackets and the running board are 16 gauge steel—requiring extra care to obtain a satisfactory weld.

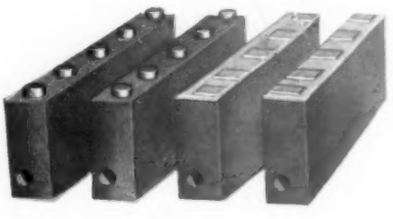
Copper electrodes formerly used on this job had to be redressed so often (every 2 hours) that they finally equipped the welding machine with *ELKONITE*. At the time of the last report these *ELKONITE* electrodes had been making excellent welds for 4 weeks and were still operating. In the illustration above, the upper set of electrodes may be seen above the running board which is in position for the weld.

ELKONITE electrodes last 10 to 80 times longer than copper and make a better weld with less shrinkage. And they require less redressing, which means greatly increased production and decreased costs. Since the introduction of *ELKONITE* many new resistance welding applications have been developed which were impractical commercially with other electrode material. Our engineers will be glad to show you how *ELKONITE* can be profitably used on your resistance welding applications.



(Above) Section of the running board before and after welding the brackets. Both parts are 16 gauge steel—requiring reliable electrodes to make a good weld.

(Below) The *ELKONITE* electrodes used on this job. The Elkonite may be seen on the top portion of each electrode.



ELKON, Inc. (*Elkonite* Dept.)

Division of P. R. Mallory & Co., Inc.

3029 East Washington Street, Indianapolis Ind.

ELKONITE

REG. U.S. PAT. OFF.

SO the smallest towns may be supplied as abundantly as the largest cities.

SO the needs of the smallest users of oxyacetylene welding and cutting gases, apparatus, and supplies may be met as promptly as those of the largest users.

THE AIR REDUCTION SALES COMPANY with 24 district sales offices, operates 53 oxygen plants, 24 acetylene plants, and maintains 115 distributing stations located at industrial centers throughout the country.

AIR REDUCTION SALES COMPANY

Manufacturers and distributors of Airco Oxygen, Airco Acetylene, Airco National Carbide
Airco-Davis-Bournonville Welding and Cutting Apparatus and Welding Supplies

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Bettendorf, Ia.
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New Orleans
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Richmond
Seattle
St. Louis
Wheeling

88 Plants

Home Office: 342 Madison Ave., New York City, N. Y.

115 Warehouses

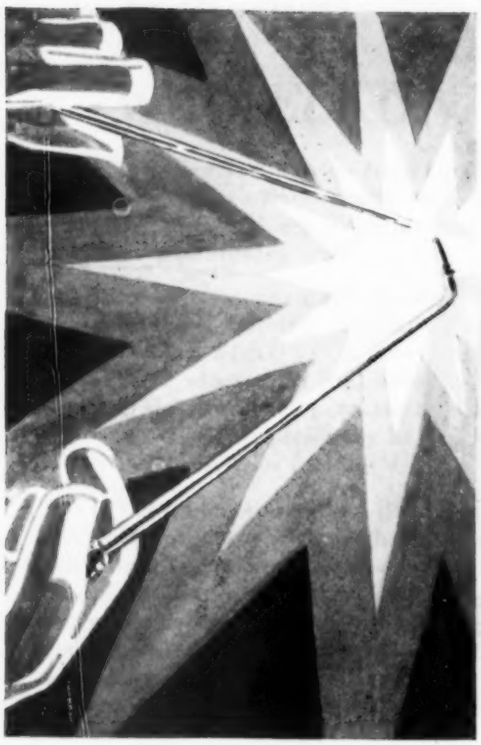
CHASE

CHASE WELDING ROD

Chase Chāmet Bronze Welding Rod

Chase Manganese Bronze Welding Rod

Chase Brass Welding Rod



CHASE

Chase is always at your service . .

There are 13 Chase Warehouses throughout the country, all with complete stocks of Chase Welding Rod.

One of these warehouses is near you. On a rush job, you can always count on immediate delivery from Chase—by special truck if necessary.

Chase Welding Rod—in Brass, Manganese Bronze and Chāmet Bronze*—is guaranteed by Chase to give you tough, lasting welds. Look for the name Chase stamped on every length.

*Chase Chāmet Bronze Welding Rod is made from a special mixture of bronze developed in our own laboratories. We have named it Chāmet to distinguish it from ordinary kinds of bronze. Details of tensile strength, elasticity and machining properties gladly mailed upon request.

CHASE

The mark that identifies good brass and copper products.

CHASE BRASS & COPPER CO.
—INCORPORATED—

Home Office . . . Waterbury, Connecticut

And prompt deliveries always from the nearest of our thirteen warehouses in
New York • Boston • Newark • Philadelphia • Baltimore • Cincinnati
Cleveland • Detroit • Chicago • St. Louis • New Orleans • Los Angeles
San Francisco • (*Also Branch Offices in Rochester, Pittsburgh and Dallas.*)

The Welding Engineer

Founded by L. B. Mackenzie, 1916

Volume 14 | June, 1929 | Number 6

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The Statue of Liberty of Business

Advertising might be likened, metaphorically, to the Statue of Liberty, that colossal bronze figure which is so impressively located in New York harbor.

Just as the statue indicates to the immigrant, a country where he is privileged to an equal citizenship, so does advertising indicate to the business man:—

—a country where he is privileged to buy and sell on an equal basis with other citizens.

—a country where business is transacted on a higher plane—where there is but little of the deceit, favoritism and haggling so characteristic of non-advertising Oriental and Occidental commerce.

—a country where education governs buying; where the prospective purchaser is fed with facts by the seller.

—a country where the smallest manufacturer or distributor is given the opportunity to use all publicity and selling media and at published standard rates.

Would it be correct, therefore, to term *Advertising* as *"The Statue of Liberty of Business"?*

And if this be allowable can we not consider the advertising section of this issue of *The Welding Engineer* as a torch flame of the statue—lighting for its readers the ways to *Interest, Knowledge* and *Profit.*

Published on the 15th of Each Month by

THE WELDING ENGINEER PUBLISHING CO.,
608 S. Dearborn St., Chicago, Ill.
Telephone Wabash 7134

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Last Advertising forms close at 8:00 a. m. on the 12th. To show proof for correction copy must be received at an earlier date and allowances should be made for delay to mails. All copy should be in by the 12th of the month at the latest.

The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

Authorized Representatives

CLEVELAND—R. K. Randall, 2094 E. 19th St.
DENVER—A. G. Odell, Public Opportunity School.
GREAT BRITAIN—Capt. D. Richardson, 36 Winterbrook Road, Herne Hill, London.
AUSTRALIA AND NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand.
SOUTH AFRICA—J. W. Arnison, 35a Victoria Ave., Benoni, Transvaal, South Africa

A NEW KIND OF

PATENTED
OTHERS PENDING
U. S. A. AND
FOREIGN COUNTRIES

America's pioneer maker of oxy-acetylene apparatus announce a revolutionary improvement.

The MULTI COPYRIGHTED STAGE GAS PRESSURE REGULATOR

Two stages of reduction
Two important results

1. Accurate regulation at the smaller working pressures.

2. Elimination of all common causes of regulator trouble.

Authorities agree that a true neutral flame is the ideal flame for welding. A true neutral flame can only be obtained by exact proportioning of gases, which, in turn, demands that the gas pressures must be kept unvarying within a fraction of an ounce. Pressure fluctuations from any cause will inevitably change the flame. With one-stage reduction of pressure the effect of even small dust particles may be magnified hundreds of times, enough to alter the character of the flame appreciably. With multi-stage reduction all such causes of fluctuation are ABSORBED IN THE FIRST stage, and the final reduction is extremely accurate, both because the cause of fluctuation is removed and because the initial pressure of this final stage is very much closer to the working pressure.

Usually a three-stage compressor is required to store oxygen in cylinders under 2000 pounds pressure. Yet every other regulator on the market represents an attempt to reduce the tank pressure to working pressure with a single reduction. When average working pressures are needed, this is just too much for the ordinary regulator. Multi-stage reduction removes ninety-five per cent of the full tank pressure before the final reduction stage begins to function. Furthermore, this final reduction stage draws oxygen from a gas chamber where it is automatically held at 100 lbs. pressure. The result is that oxygen is delivered UNIFORMLY and ACCURATELY to a degree which has been considered impossible.

REGULATOR

Since the beginning of oxy-acetylene welding, regulators have been made by adapting designs of reducing valves made for other purposes. The HARRIS MULTI-STAGE Regulator is designed for welding, and therefore fulfills every requirement of a welding regulator.

Fundamentally and basically they POSITIVELY INSURE the constant maintenance of a "CORRECT FLAME" and "THE FLAME IS THE THING" in welding: it is the ultimate end sought by the welder—all things lead to the Flame. This desirable and long sought objective is attained through the use of multi-stage reduction of the cylinder gas pressure through two stages. The first stage takes the long drop from the cylinder pressure down to a practical, constant sub-pressure from whence the gas is passed at such reduced pressure to the second stage and thence to the torch. A few of the pertinent and all important factors found in Harris MULTI-STAGE Regulators are:

1. Two stages of Pressure Control positively INSURE correct flames.
2. Multi Stage reduction permits the use of proper seats of different characters, each best for its function. It is not a case of one seat for the dual purpose of HOLDING 2,000 pounds pressure and CONTROLLING it also.
3. Double diaphragmic action (by two diaphragms, each of the proper diameter and material) correctly proportions the control and release burden.
4. Two springs in support of the diaphragms divide the spring tension load in its course from cylinder to torch tip effecting constance and accuracy of gas flow.
5. The design drops from use the arm supported nozzle and seat which required perfection in alignment under difficult conditions of design.

Side view showing compactness of new MULTI-STAGE Regulator

Approved by The Underwriters

HARRIS MULTI-STAGE Regulators have these exclusive features:

The Regulator is broadly revolutionary and at the same time (like all worthwhile discoveries) SIMPLE and COMPACT.
All parts are easily accessible.
Material—Forged throughout—the best the market affords.
The First Stage PROTECTS the Second Stage.
With adjusting screw set at WORKING PRESSURE, the full cylinder pressure may be turned on without injury to the regulator in any way.
Sand and dust accumulated in cylinder valves can be blown into regulator without disturbing its functioning—a protective cartridge stands guard.

BY ALL MEANS INVESTIGATE.
MULTI-STAGE IS THE ANSWER TO YOUR REGULATOR PROBLEMS.

Manufactured by

HARRIS CALORIFIC CO.
Cleveland, Ohio

Oxy-Acetylene Torches, Regulators, Acetylene Generators, Gasavers, Valves, Manifolds.

Any of the distributors listed below will cheerfully furnish full information

ational Oxygen Co.	Akron, Ohio
lbany Calcium Light Co	Albany, N. Y.
. S. Armstrong & Bro. Co	Atlanta, Ga.
oore-Handley Hdwe. Co	Birmingham, Ala.
astern Service Company	Boston, Mass.
nternational Oxygen Co	Buffalo, N. Y.
. J. Krull	Canton, Ohio
ational Oxygen Co	Chicago, Ill.
uckeye Welding Supply Co	Cleveland, Ohio
elding Metals Mfg. Co	Detroit, Mich.
mithweld Equipment Co	Ft. Worth, Texas
mithweld Company	Houston, Texas
wank Hardware Co	Johnstown, Pa.
lo-Ark Oxygen Company	Ft. Smith, Ark.
ogansport Oxygen Company	Logansport, Ind.
. A. Mackey	Los Angeles, Calif.
The Riechman-Crosby Co	Memphis, Tenn.
Automotive Supply Co	Minneapolis, Minn.
Knapp Supply Co	Muncie, Ind.
International Oxygen Co	Newark, N. J.
Modern Welders Supply House	New Orleans, La.
Balbach Company	Omaha, Nebr.
Pittsburgh Thermoline Co	Philadelphia, Pa.
Hope Construction & Refining Co	Pittsburgh, Pa.
Martin's Service Co	Pittsburgh, Pa.
Pittsburgh Thermoline Co	Pittsburgh, Pa.
Cook Iron Store Co	Rochester, N. Y.
Poss & Shaw, Inc	San Francisco, Calif.
Seattle Hdwe. Co	Seattle, Wash.
Washington Mchy. & Supply Co	Spokane, Wash.
International Oxygen Co	Tariffville, Conn.
International Oxygen Co	Toledo, Ohio
International Oxygen Co	Verona, Pa.
McLendon Hardware Co	Waco, Texas
Miller & Stein	Wheeling, W. Va.
Phoenix General Sales Co	Wichita, Kans.
Mahoning Welding Equipment Co.	Youngstown, Ohio

CANADA

Precision Machine & Foundry Ltd	Calgary, Alberta
Carter Torch & Supply Co	Hamilton, Ontario
Welding & Metal Trades Supply Ltd.,	Vancouver, B. C.
H. B. Holden Company	Windsor, Ontario
Seattle Hardware Co	Alaska
Seattle Hardware Co	Honolulu, T. H.
Tropical Sales Agency	Havana, Cuba

Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

ACETYLENE (Compressed in Cylinders)
Air Reduction Sales Co.
Commercial Acetylene Supply Co.
Kansas City Oxygen Gas Co.
International Oxygen Co.
Prest-O-Lite Co.
Superior Oxy-Acetylene Co.

ACETYLENE CYLINDERS
Pressed Steel Tank Co.

ACETYLENE WELDING WIRE
Air Reduction Sales Co.
American Brass Co.
American Steel & Wire Co.
Atlas Foundry Co.
Central Steel & Wire Co.
Craftsweld Equipment Co.
Fusion Welding Corporation
E. D. Giberson & Co.
C. H. Hollup Corp.
Igoe Brothers
Imperial Brass Mfg. Co.
Kansas City Oxygen Gas Co.
Koro Corporation
Mueller Brass Co.
Oxweld Acetylene Co.
Page Steel & Wire Co.
Reid-Avery Co.
Roebling, John A., Sons Co.
Seneca Wire Mfg. Co.
St. Paul Welding & Mfg. Co.
Standard Steel & Wire Co.
Steel Sales Corp.
Stoody Co.
Joseph T. Ryerson & Sons, Inc.
Superior Oxy-Acetylene Co.
Taylor-Wharton Iron & Steel Co.
Torchweld Equipment Co.
Wickwire Spencer Steel Corp.
Weldit Acetylene Co.
Williams & Co.

AIR LIQUEFACTION OXYGEN PRODUCING PLANTS
Keith Dunham Company
Heylandt Sales Co.

ALUMINO-THERMIC WELDING
Metal & Thermit Corporation

ALUMINUM SOLDER
Crown Aluminum Solder Co.
Reynolds Metals Co.

ANNEALING FURNACES
General Electric Co.
Westinghouse Elec. & Mfg. Co

APRONS (Asbestos)
Ideal Face Shield Co.

ASBESTOS INSULATED WIRE AND CABLE
Central Steel & Wire Co.

BLOW PIPES
See "Torches."

BOOKS
The Welding Engineer Pub. Co.
General Electric Co.
Lincoln Electric Co.
Linde Air Products Co.
Electric Arc Cutting & Welding Co
Larry Sherman & Co.

BRAZING OUTFITS
Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
General Welding and Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Alexander Milburn Co
Modern Engineering Co.
Oxweld Acetylene Co.
Sight Feed Generator Co.
Superior Oxy-Acetylene Co.
Torchweld Equipment Co.
Victor Oxy-Acetylene Equipment Co.
Williams & Co.

BRONZE FILLER RODS
American Brass Co.
Central Steel & Wire Co.
Chase Brass and Copper Co., Inc.
Mueller Brass Co.
Oxweld Acetylene Co.
Steel Sales Corp.

BUFFERS
Biax Flexible Shaft Co.
R. G. Haskins Co.
N. A. Strand & Co.

BUTT WELDERS
See "Electric Resistance Welders"

CABLE (Arc Welding)
Allan Mfg. & Welding Co.
Central Steel & Wire Co.
Electric Arc Cutting & Welding Co.
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Lincoln Electric Co.
Quasi-Arc Weldtrode Co.
John A. Roebling Sons Co.
Joseph T. Ryerson & Sons, Inc.
Westinghouse Elec. & Mfg. Co
Wilson Welder & Metals Co.

CARBIDE
Air Reduction Sales Co.
National Carbide Co.
Shawinigan Products Corp.
Superior Oxy-Acetylene Co.
Union Carbide Sales Co.

CARBON (Blocks, Paste, Electrodes, etc.)
Air Reduction Sales Co.
Central Steel & Wire Co.
Electric Arc Cutting & Welding Co
National Carbon Co.
Oxweld Acetylene Co.

CARBON BURNING EQUIPMENT
Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Superior Oxy-Acetylene Co.
Torchweld Equipment Co.
Victor Oxy-Acetylene Equipment Co.

CAST IRON SOLDER
Crown Aluminum Solder Co.
Superior Oxy-Acetylene Co.
Weldene Corporation

CAUSTIC POTASH
Innis, Speiden & Company

CUTTING ELECTRODES (Electric Arc)
Allan Mfg. & Welding Co.
Electric Arc Cutting & Welding Co
General Electric Co.
Lincoln Electric Co.
National Carbon Co
Westinghouse Elec. & Mfg. Co
Wilson Welder & Metals Co.

CYLINDERS (Acetylene)
Pressed Steel Tank Co.

CYLINDERS (Oxygen, Hydrogen)
Chas. L. Gulick.
Wm. Wharton, Jr. Co.
Harrisburg Pipe & Pipe Bending Co.

DRILLS, PORTABLE ELECTRIC
Biax Flexible Shaft Co.
R. G. Haskins Co.
Stoody Company
N. A. Strand & Co.

ELECTRIC ARC WELDING OUTFITS
Allan Mfg. & Welding Co
American Steel Engineering Co.
Burke Electric Co.
Chicago Steel & Wire Co.
Electric Arc Cutting & Welding Co
Electric Welding Machine Co.
Fusion Welding Corporation
General Electric Co.
Goodman Electric Machinery Co.
Gibb Welding Machines Co.
Hobart Bros. Co.
C. H. Hollup Corp.
Lincoln Electric Co.
E. A. Lundy Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc Incorporated
Joseph T. Ryerson & Sons, Inc.
Stoody Co.
Superior Oxy-Acetylene Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRIC RESISTANCE WELDERS
Federal Machine & Welder Co.
General Electric Co.
Gibb Welding Machines Co.
Goodman Electric Machinery Co.

ELECTRODES (Carbon Arc Welding)
See "Cutting Electrodes"

ELECTRODES (Metallic Arc Welding)
American Steel & Wire Co.
Atlas Foundry Co.
Central Steel & Wire Co.
Chicago Steel & Wire Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corporation
General Electric Co.
Gibb Welding Machines Co.
E. D. Giberson & Co.
C. H. Hollup Corporation
Igoe Brothers
Koro Corporation
Lincoln Electric Co.
National Welding Products Corp.
Page Steel & Wire Co.
Quasi-Arc Incorporated
Reid-Avery Co.
Roebling, John A., Sons Co
Joseph T. Ryerson & Sons, Inc.
Seneca Wire Mfg. Co.
Standard Steel & Wire Co.
Steel Sales Corp.
Stoody Company
Taylor-Wharton Iron & Steel Co.
Wickwire Spencer Steel Corp.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE HOLDERS
Allan Mfg. & Welding Co.
Burke Electric Co.
Chicago Steel & Wire Co.
Electric Welding Machine Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Koro Corporation.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Stoody Co.
Superior Oxy-Acetylene Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE TIPS (Resistance Welding)
Elkon, Inc.

ELECTROLYTIC OXYGEN AND HYDROGEN GENERATING EQUIPMENT
International Oxygen Co.

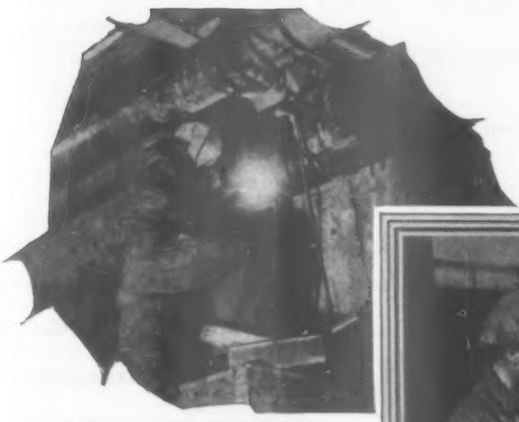
FACE SHIELDS (Arc Welding)
Allan Mfg. Co. & Welding Co.
American Optical Co.
Burke Electric Co.
Central Steel & Wire Co.
Chicago Eye Shield Co.
Electric Arc Cutting & Welding Co
Fibre-Metal Products Co.
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc Incorporated
Stoody Company
Joseph T. Ryerson & Sons, Inc.
Sellstrom Mfg. Co.
Superior Oxy-Acetylene Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.
Wilson Products, Inc.

FIREPROOF PLASTIC MATERIAL
Air Reduction Sales Co.
National Carbon Co.

FLUE WELDERS (Electric)
General Electric Co.

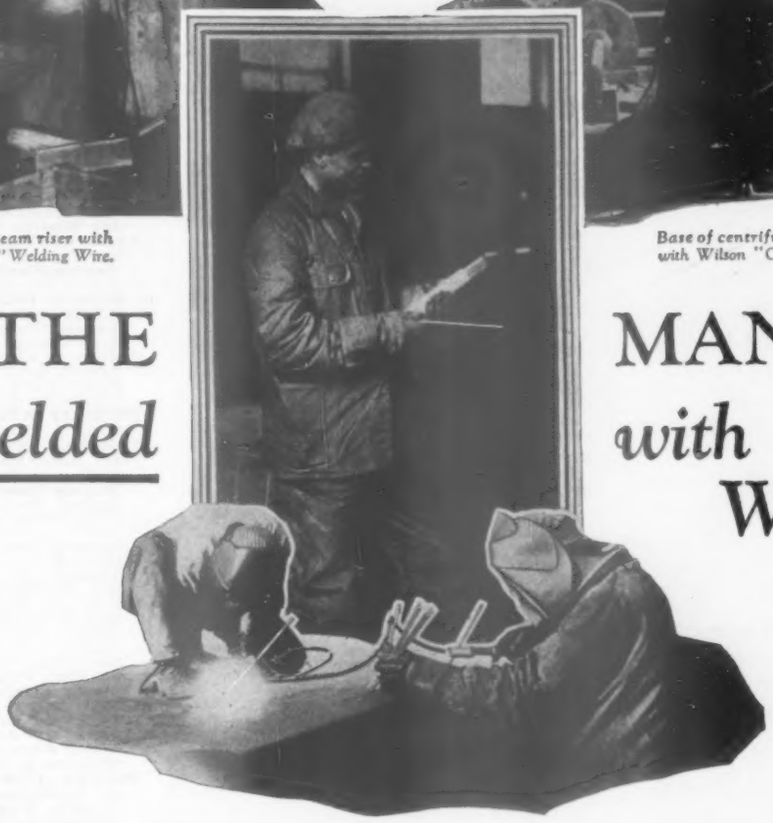
FLUXES
Air Reduction Sales Co.
Anti-Borax Compound Co.
Kansas City Oxygen Gas Co.
Metal & Thermit Corp.
Central Steel & Wire Co.
Modern Engineering Co.
Oxweld Acetylene Co.
St. Paul Welding & Mfg. Co.
Superior Oxy-Acetylene Co.
Torchweld Equipment Co.
Weldit Acetylene Co.

GAS SAVING DEVICES
Harris Calorific Co.
Weldit Acetylene Co.



Welding a 16" steam riser with Wilson "Color-tipt" Welding Wire.

Base of centrifugal pump being welded with Wilson "Color-tipt" Welding Wire.



ASK THE MAN WHO *has welded* *with Wilson Wire!*

HE WILL tell you that you can always secure just the *right* grade (analysis) of Wilson Wire for the particular metal you are welding. He will tell you that every grade is *uniform*—that every rod runs the same as every other rod of the same grade and diameter—whether purchased last year, today, or a year hence.

The *correct analysis* and *perfect uniformity* in Wilson Wire insure *more metal* deposited in the weld—and this means not only better welds but wages saved.

Give your welders the right grades of Wilson Wire for the metals they are welding: No. 4 for securing a hard wearing surface; No. 6 for steels having a copper content; No. 9 for high tensile strength; No. 12 for machineable welds on cast iron; No. 17 for general work; No. 20 for welding brass, bronze and light gauge copper; No. 50 for welding sheet and cast aluminum; special rods for welding stainless steels.

Samples sent on request—also bulletin describing Wilson Machines.

WILSON WELDER & METALS CO. INC., 20 WILSON BUILDING, HOBOKEN, N. J.

WILSON

WELDING MACHINES AND WELDING WIRE

GLOVES (Asbestos)
Ideal Face Shield Co.
GAUGES
Moto Meter Co.
National Gauge & Equipment Co.
GENERATORS (Acetylene)
Air Reduction Sales Co.
Bastian-Blessing Co.
Brooks Machine Co.
Craftsweld Equipment Co.
Imperial Brass Mfg. Co.
Harris Calorific Co.
Milburn, Alexander Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Sight Feed Generator Co.
GLOVES
Morrison-Ricker Mfg. Co.
GOGGLES
American Optical Co.
Chicago Eye Shield Co.
Ideal Face Shield Co.
Sellstrom Mfg. Co.
Willson Products, Inc.
GRINDERS (Portable Electric)
R. G. Haskins Co.
Stoody Company.
N. A. Strand & Co.
HELMETS (Arc Welding)
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Thanks for the proof. SWEDOX sure is the wire for us!

FOR every welding requirement there is a SWEDOX wire that is right. We first prove it to ourselves; then we are prepared to prove it to you. An inquiry describing your work will put you in line for more carefully selected welding wires and electrodes —merit-proven in every respect.

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Extended
East 150

DETROIT, MICH.
5001 Bellevue Ave.
Whittier 6780

SWEDOX

WELDING RODS, WIRES and ELECTRODES

"Here, Lad—

You tell me you're sure that the Lincoln welder is away ahead of all makes and you produce a lot of scientific data to prove you're right.

Can't you give me some simple tests by which even my lay mind can be convinced you're right.

You know, Lad, you've been known to be wrong at times."

"Yes, Pop—

but not twice in the same place.

I saw a very telling test back in our shop yesterday noon.

The operators were having a race to see which machine could weld a given length of seam with fewest breaks in the arc.

The Lincoln machine broke only three times—while your old friend's welder broke 10 times.

It seems to me that the real test of any machine is the amount of work it will do in a day.

And in our shop, or any others that I am familiar with, no machine has yet equalled the Lincoln 'Stable-Arc' welder in production.

True, Pop, I have been wrong at times—I was when I didn't get the Lincoln in the first place—but if it wasn't for rectifying the mistakes of our youth, we'd have nothing to do in our old age."

The Lincoln "Stable-Arc" Welder

—welds easier
—makes better welds
— permits greater output

because of the steady uniform arc throughout entire welding range, which is the result of:

- **Variable voltage design**
- **Laminated magnetic circuit**
- **Separately-excited generator field**
- **Double control of welding heat**
- **All steel construction**

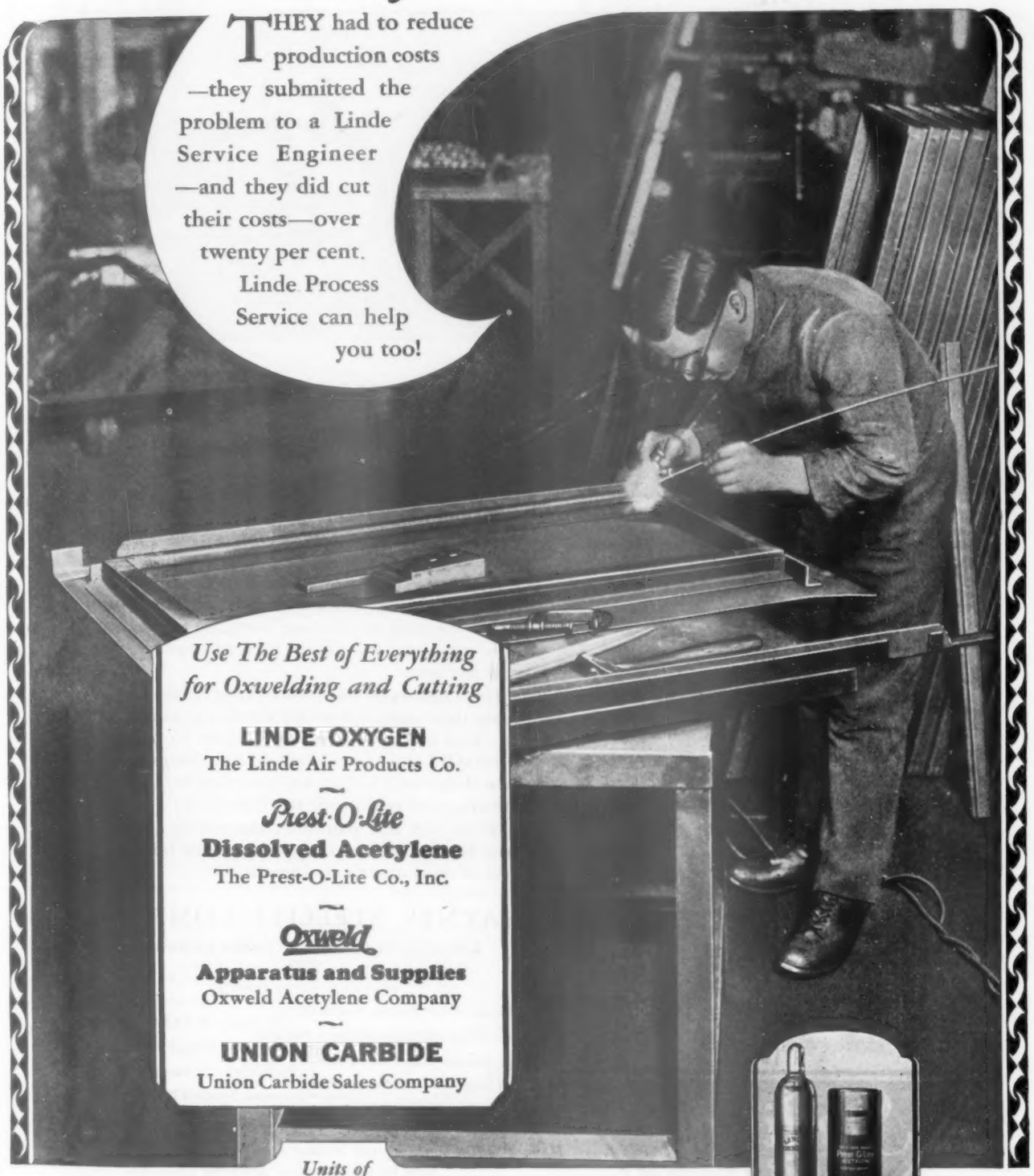
No other welder has all these features.

The Lincoln Electric Co.
Dept. No. 27-6, Cleveland, O.

W-94

"Stable-Arc" LINCOLN WELDER

—and they did cut their costs!


THEY had to reduce production costs —they submitted the problem to a Linde Service Engineer —and they did cut their costs—over twenty per cent. Linde Process Service can help you too!
Use The Best of Everything for Oxwelding and Cutting
LINDE OXYGEN
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64 Linde Plants—45 Prest-O-Lite Plants—154 Oxygen Warehouse Stocks—138 Acetylene Warehouse Stocks—38 Apparatus Warehouse Stocks —235 Carbide Warehouse Stocks

This photograph shows the location of Haynes Stellite welding rod. A band approximately ½" wide and 3/64" thick is applied on the top of the cutting edge. The top and bottom sides of the point are also coated with Haynes Stellite welding rod 2" from the extreme point and ⅛" thick.

Long wearing plow shares

HAYNES STELLITED plow shares wear from four to five times as long as regular steel shares and cost less than twice as much.

By the use of the Stelliting process (the application of Haynes Stellite in the form of welding rod to wearing and cutting surfaces) farmers can now procure plow shares that will reduce their cost per acre.

Farm equipment dealers and welding shops—Develop this business with the farmers in your locality. You can apply Haynes Stellite to new and worn solid or soft center steel plow shares in your own shops and render a real service to your customers, with real profit to yourselves.

Write for our pamphlet describing in detail how Haynes Stellite is applied to this important part of the farmer's equipment.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

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Cleveland—628 Keith Building
Detroit—4-240 General Motors Building
Houston—6119 Harrisburg Building
Los Angeles—1310 Santee Street
New York—30 East 42nd Street
San Francisco—114 Sansome Street
Tulsa—Exchange National Bank Building

General Offices—Kokomo, Indiana

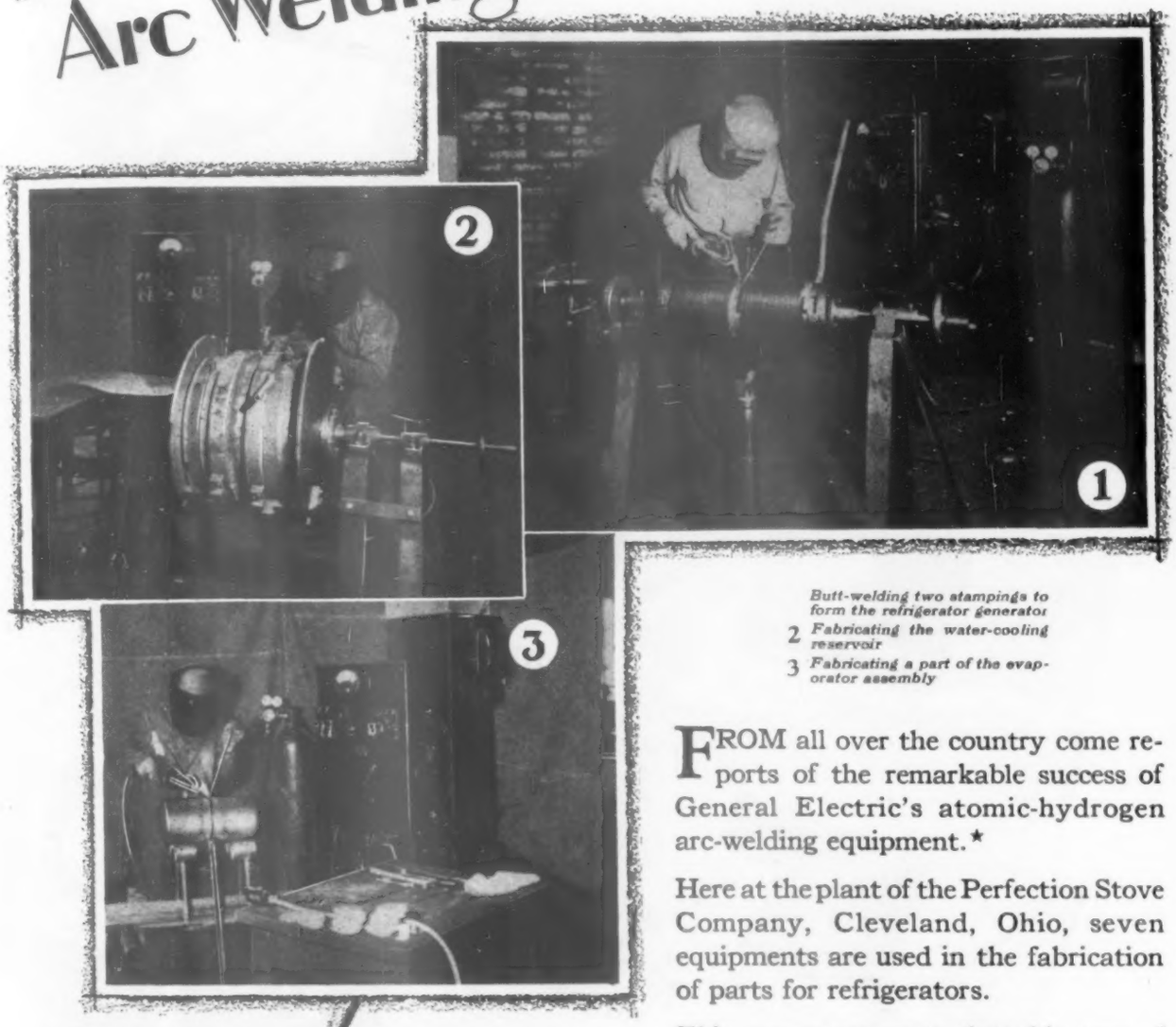
Haynes Stellite welding rod is also available from any of the 28 District Sales Offices of Oxweld Acetylene Company

Stelliting with

HAYNES STELLITE

Atomic Hydrogen Arc Welding

At the Perfection Stove Co.



Butt-welding two stampings to form the refrigerator generator

2 *Fabricating the water-cooling reservoir*

3 *Fabricating a part of the evaporator assembly*

FROM all over the country come reports of the remarkable success of General Electric's atomic-hydrogen arc-welding equipment.*

Here at the plant of the Perfection Stove Company, Cleveland, Ohio, seven equipments are used in the fabrication of parts for refrigerators.

This company reports that this type of welding is from two to five times faster than the gas welding formerly used—and even more important, the quality of the welds is not approached by any other type of welding.

Complete details as to this job or the application of atomic-hydrogen arc welding to your product are available through your nearest G-E office.

*The atomic-hydrogen arc-welder—originated by General Electric—will weld very thin metals, and metals and alloys hitherto considered unweldable. In addition, it has been found to produce exceptional results in general welding.

THE MORE YOU ARC WELD THE MORE YOU SAVE

530-62

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

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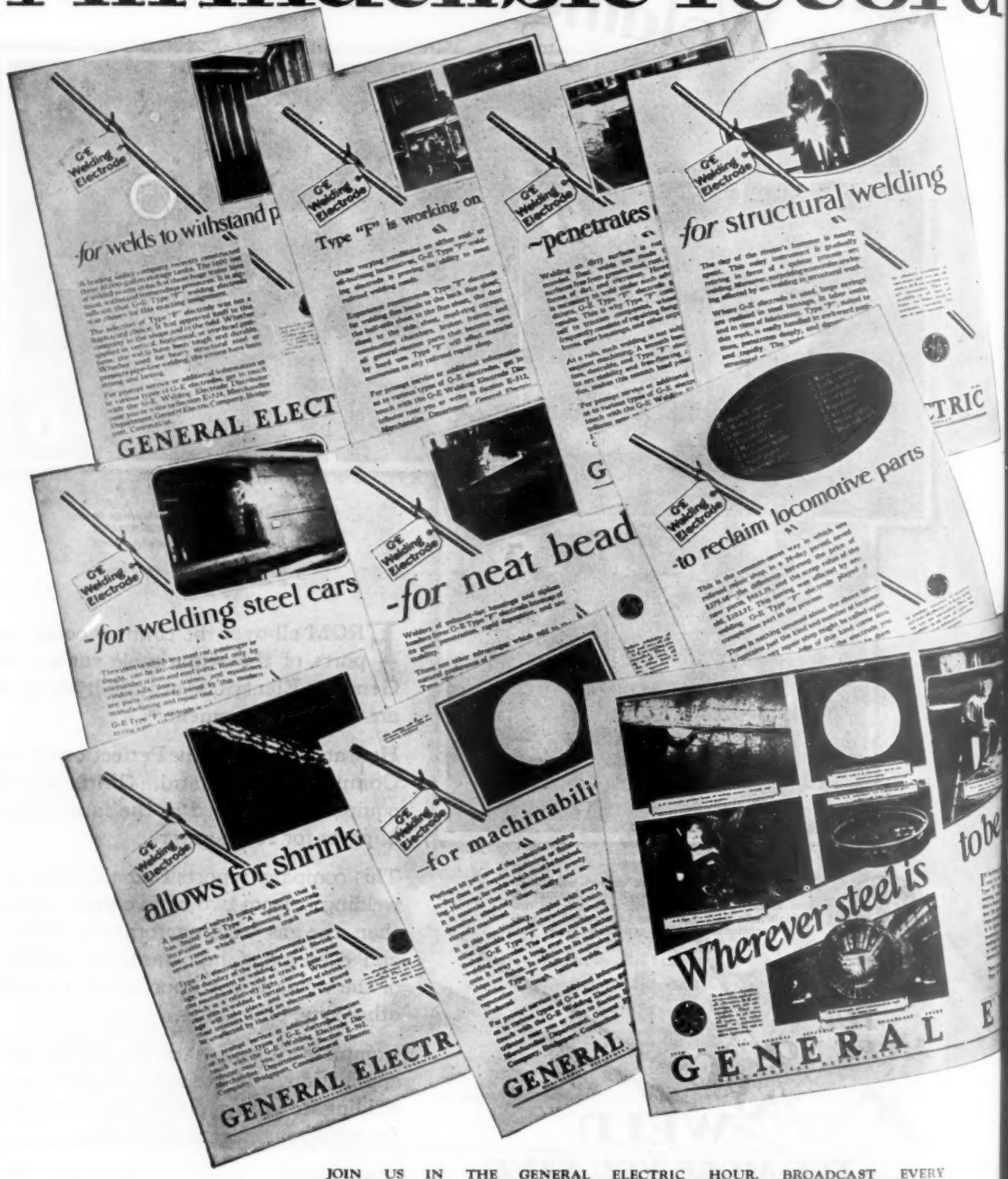

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GENERAL ELECTRIC COMPANY,

welded in steel

G-E Type "F" electrode is comparatively new. But within two years, it has attained a commanding position among electrodes. Its brief record is indelibly welded in the steel of railroads and industry.

No single quality can explain a welding operator's preference for Type "F". He may tell you that it handles easily in any position or may point out the neat welds; and you, yourself, may note its remarkable arc stability and rapid deposition. Among its many desirable characteristics, these are enough to explain the favorable reputation of Type "F".

For months, General Electric has been pointing out various applications for Type "F". Results are daily justifying its exclusive use for certain types of welding. If yours is a business *where steel is being joined to steel,* you owe it to your best interests to try this electrode in your shop.

General Electric manufactures other outstanding electrodes for different kinds of welding. For prompt service or additional information on Type "F" or other G-E electrodes, get in touch with the G-E Welding Electrode Distributor near you or write to Section E-536, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

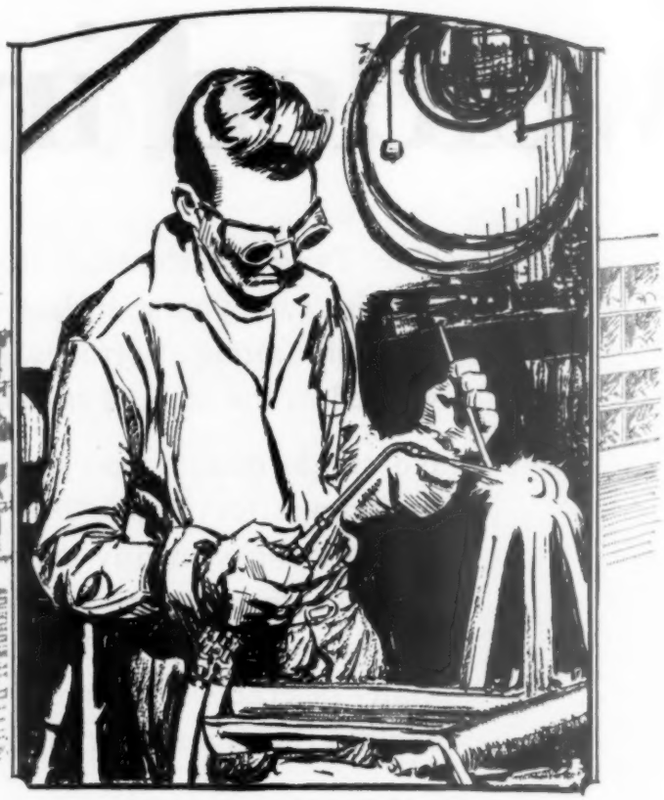
For simplicity, reliability, and ease of operation, G-E arc-welding sets are unequalled. They are available in all sizes, all types—for either hand or automatic operation—for one or more operators.

550-513

GENERAL ELECTRIC

BRIDGEPORT, CONNECTICUT

PREST-O-WELD

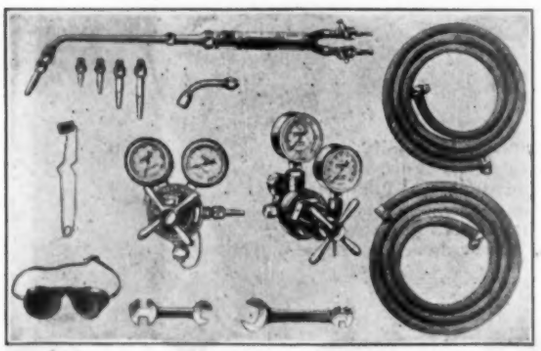


lowers spare parts investment

HOW much capital is tied up in your spare parts room? What is it costing you to insure the continuous operation of your machines?

Prest-O-Weld cutting and welding apparatus represents a modern, better method of maintenance. In shops that use it, broken and worn parts are quickly welded or built up and returned to service as good as new. It is saving money and releasing capital for profitable use.

Any good mechanic can readily learn to use Prest-O-Weld, and with reasonable practice can do any average job within the range of the process. Prest-O-Weld equipment is standard. It is simple, sturdy and dependable.



Prest-O-Weld Welding Outfit No. W-101
Price $75.00
Other utility outfits as low as $49.50
(Prices slightly higher west of the Rocky Mountains)

Made by the largest manufacturers of oxy-acetylene apparatus in the world. Sold by jobbers everywhere.

OXWELD ACETYLENE COMPANY
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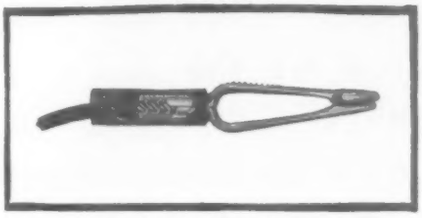
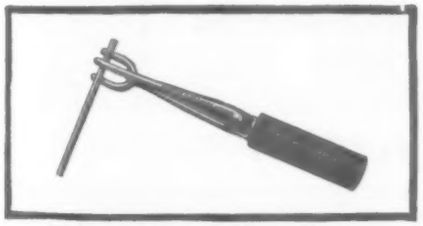
Showing simplicity, yet rigidity of construction



Lead is firmly locked in



Welding rod easily inserted. Perfect contact at all times

"Those New STOODY ELECTRODE HOLDERS *have sure cut overtime"*

"IT sure seems strange that a little thing like an electrode-holder should make such a difference. But, haven't you noticed how we leave on time... *regularly?*

"They seem simple enough Bill, but after all, it's a combination of ease of insertion, non-corrosiveness, perfect contact and simplicity that does the trick.

"Yeah! the Missus says that we're eating at regular hours for a change."

STOODY COMPANY

Manufacturers of WELDING ROD • ALLOY STEEL • EQUIPMENT

Whittier, California

You Can Bank on Mueller Welding Bronze — and on Mueller Service

Mueller WELDING BRONZE ROD

YOU will find that Mueller Welding Bronze Rod will give you the same definite result time after time. It has all the qualities that you would expect to find in a real product. It is strong and close grained . . . It melts easily and flows freely. Absence of porosity eliminates sputtering and explosions.

Mueller Welding Rod is distinguished by the wording "Mueller Welding Bronze" stamped every few inches on the rod itself.

For a special job that must machine easily or take a high finish — or for any job — you can depend on it to give you the results you must have.

When you are in a hurry you can depend upon quick delivery, too.

Mueller Brass Co.
PORT HURON MICHIGAN

THREE GENERATIONS OF BRASS MAKING

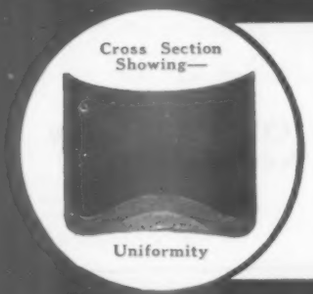
H

HARRISBURG CYLINDERS

Meet every test of STRENGTH SAFETY SATISFACTION

HARRISBURG

FORGED SEAMLESS STEEL CYLINDERS



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HARRISBURG, PA.

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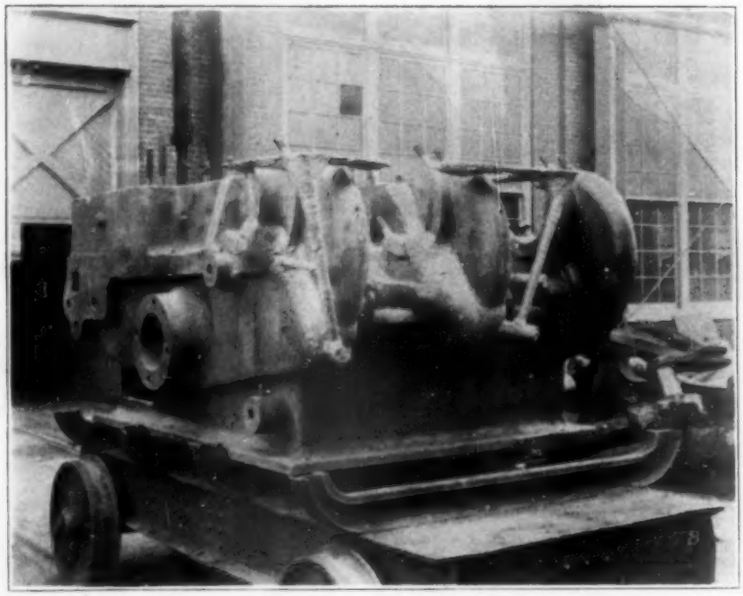
Makers of Alloy Steels in Slabs, Billets, Bars, Strips, Shapes and Hollow Forgings; Pipe Coils and Bends, Couplings and Cylinders



THERMIT WELDS
are permanent and economical

There is no guess work to Thermit Welding. The process is simple and inexpensive. The weld metal is not determined by the operator making the weld but in a carefully controlled manufacturing process. The metal in the weld is all deposited in one pouring and it is, therefore, not subject to the continued heating and cooling with the resultant strains.

Thermit steels can be made to almost any analysis and give practically any results that can be secured with the highest grade forged steels. Most of the large steel mills find Thermit saves them thousands of dollars a year.

We would be glad to send competent engineers into your plant and demonstrate to you the savings that can be made by Thermit Welding.

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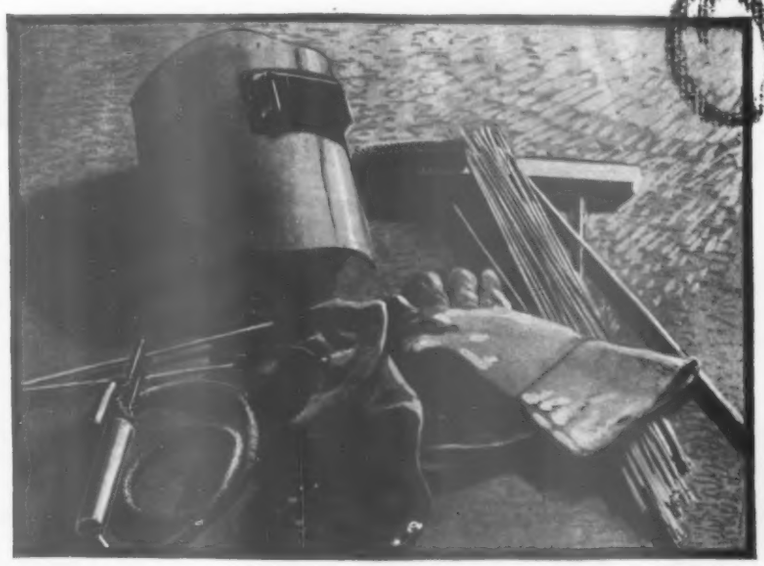


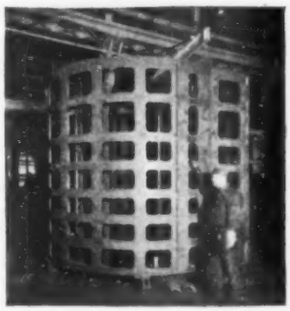
Westinghouse Accessories
have the Welder's OK

This broken scrap bailer was repaired by arc welding

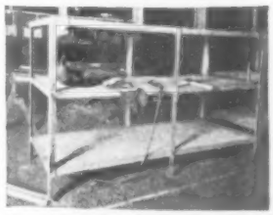
THE man who wears the helmet hour after hour and weaves the clamped electrode across the hot path of fusing metal is the man to pass judgment on the correct style for welders.

Westinghouse arc welding accessories have won the approval of an army of seasoned operators. Thousands of tons of steel have been fabricated into machines, structures and buildings by welders equipped with these accessories.

The feather weight protective helmet, the sturdy hand shield, the firmly-gripping electrode holder, and the extremely flexible welding cable have been developed and proved in the Westinghouse factories. These accessories have been designed to meet the approval of every welding operator—to enable him to work with greater speed, safety and comfort.



Arc-Welded Stator for a 94,000-kv-a. Turbo Generator



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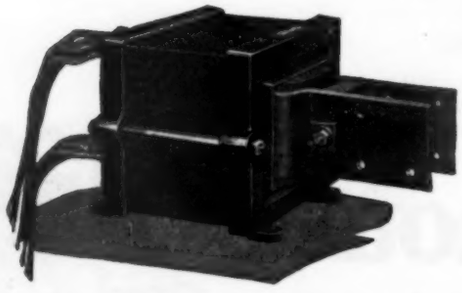

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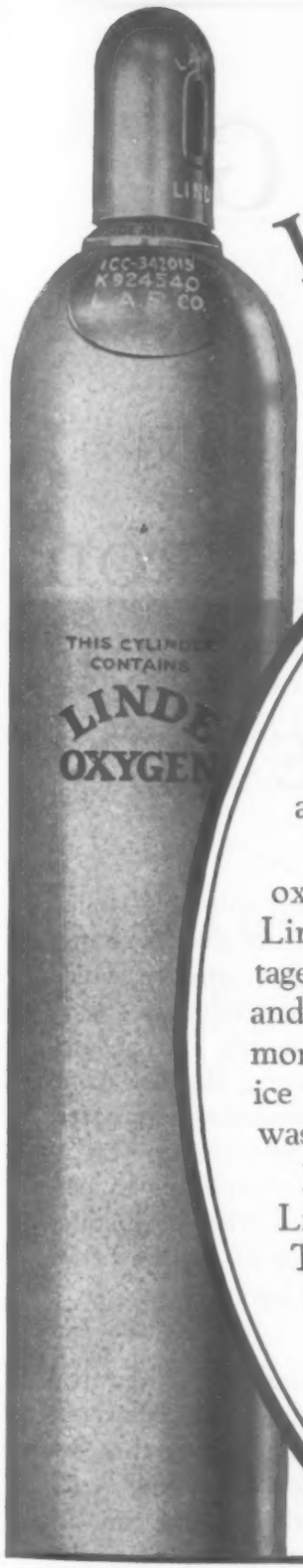

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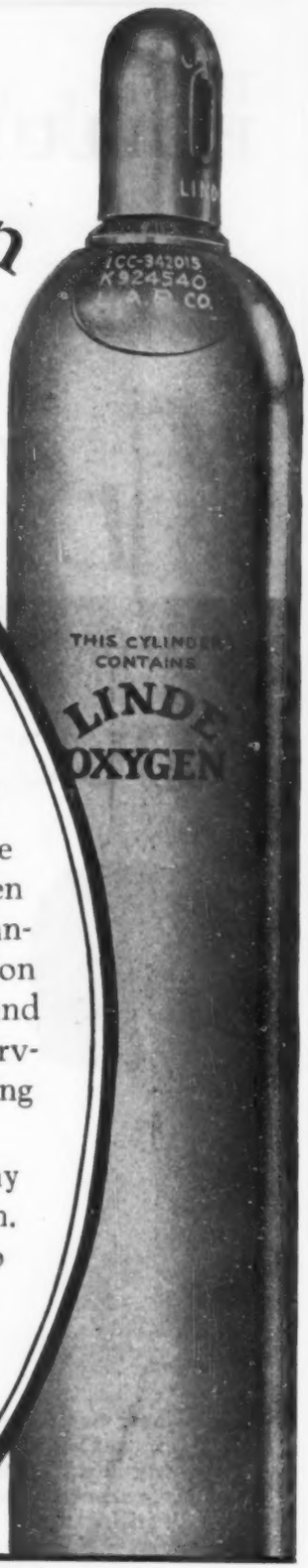

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Owen Induction Arc Welding Plants have been rendering twenty-four hour daily service since July 1924, in nearly all branches of American industries; such as, Ship Yards, Railroad Shops, Boiler Works, Structural Steel Plants, Machine Shops, Saw Works, Garages, Cotton and Woolen Mills, etc.

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THE scene above is taken from an educational motion picture film, on the subject of welded piping, produced by the Gas Products Association. The film shows why welding is the modern way of installing piping systems in all types of buildings. It contains information of great value to heating contractors, piping contractors, architects and builders. Arrangements for showing this film to interested groups can be made by corresponding with the office of the Association or any of the members listed below.

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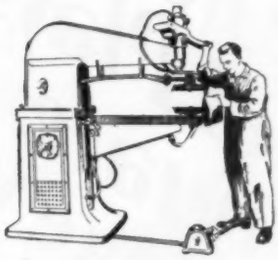

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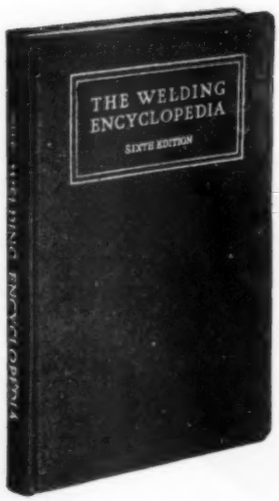

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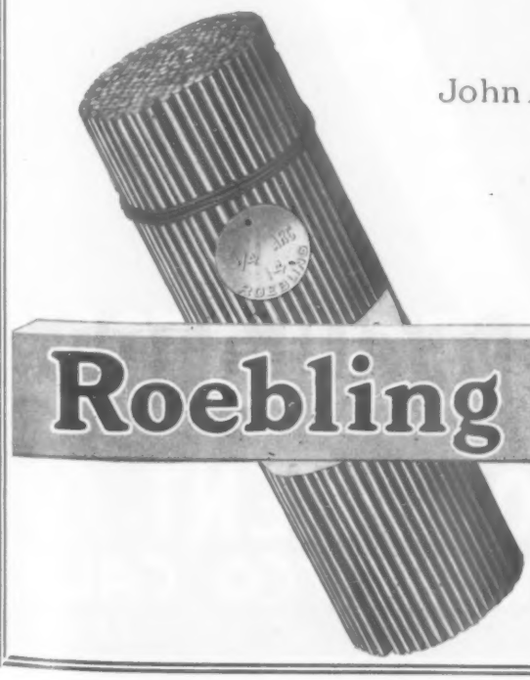

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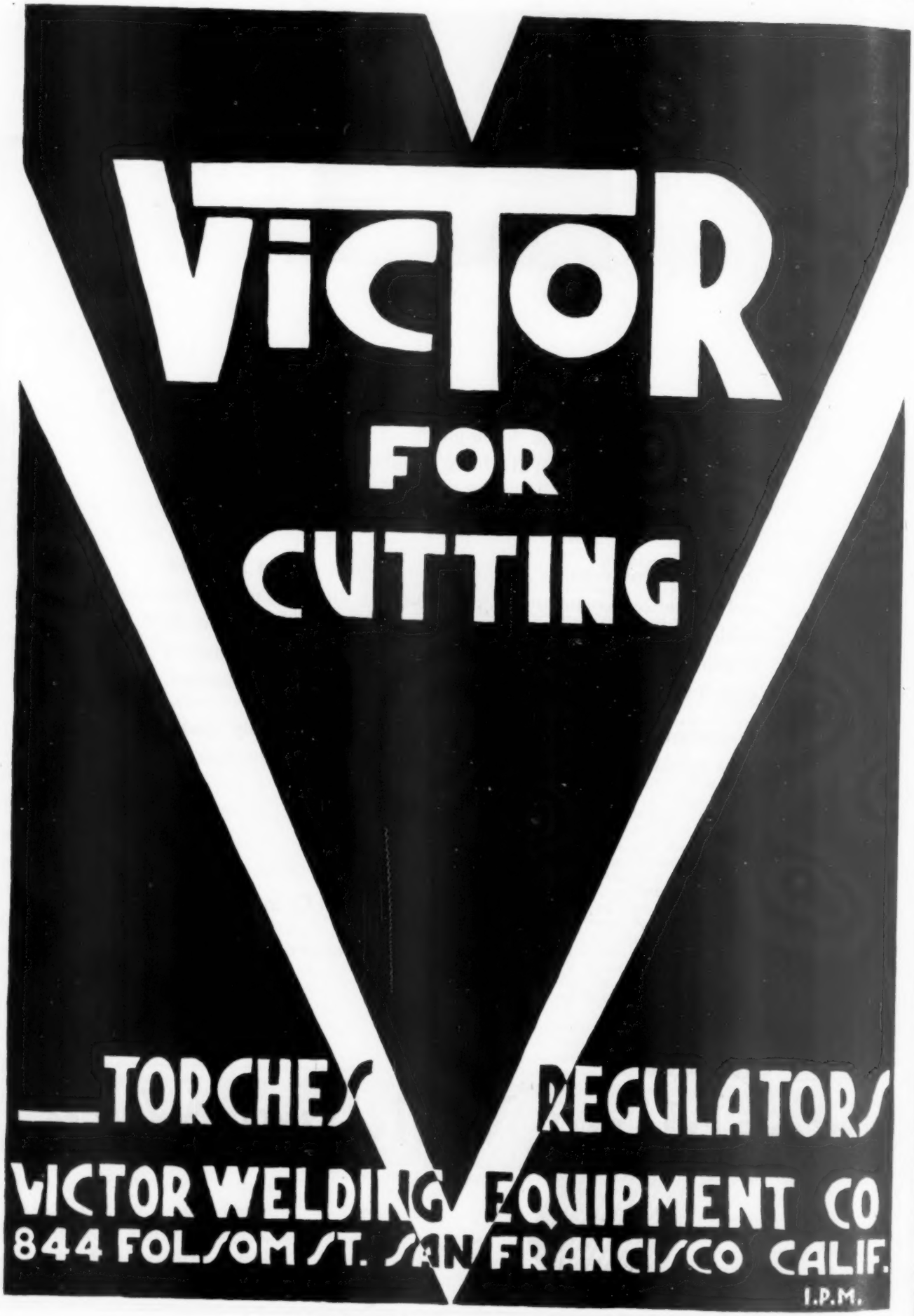
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EDITORIAL

Welded Floors Have Been Tried

FOLLOWING the publication last month of Mr. Miller's excellent account of the possibility of using welded steel for the flooring of large buildings there was received from Mr. F. C. Owen, Owen Electric Mfg. Company, Fayetteville, N. C., the following comment.

"It may be of interest to learn that about nine years ago the writer secured a contract with the Cumberland County Board of Commissioners, Fayetteville, N. C., to electric arc weld one-quarter inch sheet metal floors on the second and third stories of the Cumberland County Jail. These floors covered an area of about 1500 sq. feet. Of course, this job could not be compared to similar work on a skyscraper but it proves conclusively that it is practical and economical to use this method for flooring buildings which are intended to stand an indefinite amount of wear over an indefinite length of time."

This is not the only instance on record of the use of welded flooring. A very interesting job of this character was described in the January, 1923, issue of *The Welding Engineer*. This floor was made for the milk receiving room of the Hershey Chocolate Company. Other forms of flooring had been used in the past but had shown a tendency to crack and wear through at the point of greatest use. Some idea of the wear on the floor can be gained from the fact that about 300,000 lbs. of milk entered this room daily, mostly in 100 lb. cans. Sanitation was really a more important factor than resistance to wear but it was decided that welded steel floor would meet both requirements and when this construction was adopted it was found to be thoroughly satisfactory. There are probably a number of other cases where Mr. Miller's idea of welded steel flooring has been used to advantage. This industry is, however, indebted to him for the careful analysis which he has made of these possibilities. His suggestions point the way to a great volume of welding in a practically new field, a field in which it can serve a variety of important requirements. There are a good many men who look upon welding as offering possibilities for bringing up an entire new line of business. Here is a good suggestion for them. A man who has the imagination and energy to devote to pioneer work should be able to build up a fine specialized business in welded floors.

A Chance to Mix Welding and Art

IT HAS just been announced that the Connecticut Architectural League in cooperation with the American Institute of Steel Construction has offered $600.00 in cash prizes for designs of structural steel frame houses It is proposed that no house in this competition should cost more than $30,000.00. One of the comments made on this contest, is that structural steel, one of the latest materials to enter the field of resistance construction, is one of the most widely known, and will yield readily to new architectural style, the possibility of new homes being limited only by the imagination and taste of the designer. Undoubtedly this contest will have the effect of speeding up the use of structural steel for the frames of resistance. If so, the field for structural steel welding should be correspondingly increased, welding having already shown to especially fine advantage in the erection of the smaller structures. Some welding enthusiast who is gifted with architectural genius ought to get busy on this idea and provide a prize winning design involving the use of welding. Our industry would certainly be glad to see an all welded design win the first prize in the competition.

Encourage Well Trained Men

AN excellent way to improve employment conditions in welding departments is to give practical encouragement to welding schools who maintain a high grade of instruction for new operators. There has been a big change in the general trend of welding instruction during the past five years. In general this change can be described as an increase in the number of good welding schools and a decrease in the number of those which do not give satisfactory instruction. The value of a good course of welding instruction is that it gives an operator a systematic training in the fundamental things which he needs to know, and gets him started right in the matter of fusion without relation to any particular type of welding jobs. It has been learned by experience that men who are trained in this way are able to advance rapidly when set to work at production welding. However, they need a chance to get started. When looking for this chance they are forced to compete with other men who have had what is called "actual experience" but who nevertheless may have had very little training in the real fundamentals of the welding art. The average employer when hiring new men is all too anxious to take advantage of training secured at the other fellow's expense. This is the main reason why he hesitates to put a man to work who has not actually been on somebody's payroll as a welding operator. Once in awhile such an employer will take a chance, experimenting with a graduate from a good welding school. If the operator turns out to make rapid progress, this employer is quite likely to use the same welding school as a source of all his new help in the future. In fact it is in this way that some of the best welding schools in the country have been kept going. Once their reputation is established it is comparatively easy for them to secure employment for a reasonable number of graduates. Still it appears that some of the really fine schools in the country are not patronized and encouraged in this way as much as they should be. Employment departments should give these institutions the first chance to supply men, instead of giving them the last chance, and thus encourage them to keep up the good work which many of them have already started.

Weldability of Materials

IT has been known in welding circles for some time that when designing articles to be welded it is good practice to give careful attention to the specifications of the material. Anyone who has been welding for some time knows that materials which resemble each other very closely in chemical and physical properties may show quite a variation in weldability. For many years this point was quite commonly overlooked. That is, welding would be specified on whatever materials happened to be available for use. Those who have urged upon industrial executives the importance of having all welding done under careful management, and under the supervision of men who are well posted in welding, have seldom failed to emphasize the importance of the weldability of the materials. In fact, this is commonly set down as one of the important factors in the welding program. It is evident that considerable progress has been made in convincing industrial executives of the importance of weldability, because this property of metals has gradually come to assume considerable importance in selling raw materials. Over and over again in advertising of various metals and alloys we find reference today to the fact that they are readily welded. This was not true a few years ago. But it is altogether probable that weldability will become an increasingly important selling point and the advertising pages of the industrial magazine a record of the increasing tendency to put welding under good engineering control in order to secure maximum results.

GENERAL WELDING & EQUIPMENT CO.
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AUTOMATIC SHAPE CUTTING MACHINES

FOR

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DR. A. KREBS CONTINUES: (SEE MAY ISSUE)

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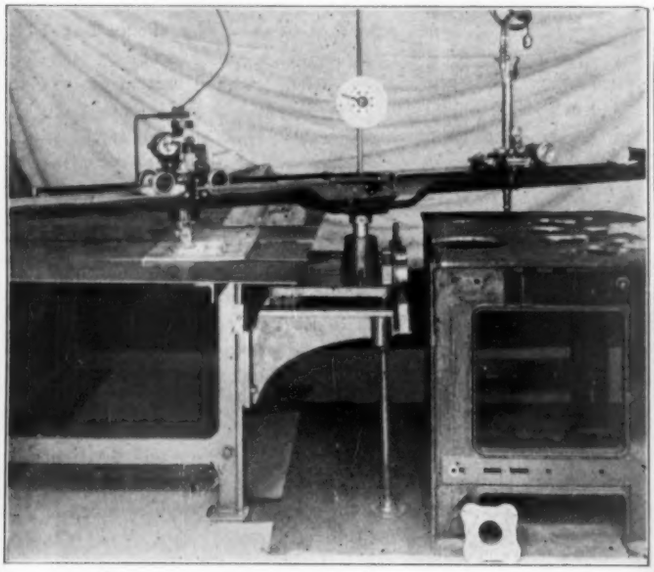
MUST NOT ONLY REPRODUCE EXACTLY, BUT DO SO PERMANENTLY WITHOUT ADJUSTMENTS. THE "GEWECO" HAVE BEEN THE ORIGINATORS OF PERMANENTLY EXACT REPRODUCTION MACHINES. WITHOUT THIS FEATURE FABRICATING AND MASS PRODUCTION IS A FAILURE. FOR INSTANCE, ONE MACHINE WITH TWO (2) TORCHES HAS TO PRODUCE 2400 LEGS FOR 600 MOTORS A WEEK. OF COURSE THEY HAVE TO BE ALL EXACT PERMANENTLY, OR MASS PRODUCTION WOULD BE UPSET.



"GEWECO UNIVERSAL" TYPE NO. 1
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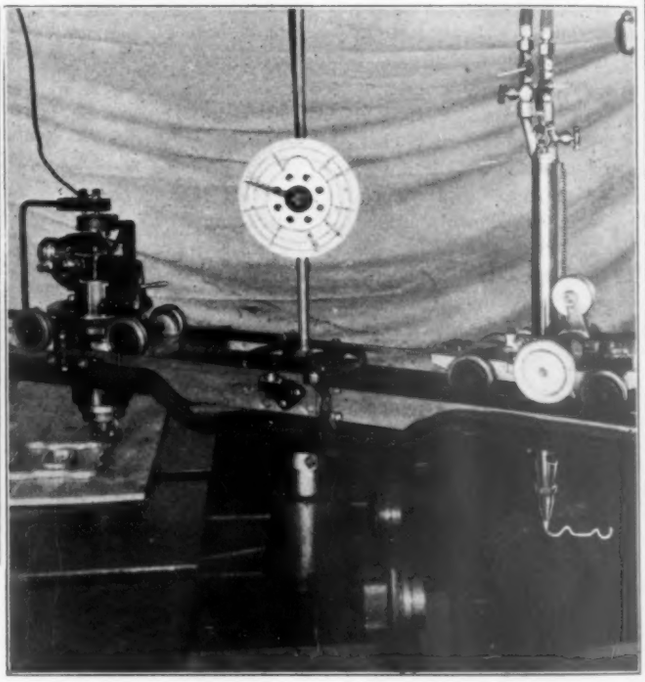


INDEPENDENT, SELF CONTAINED MANUFACTURING UNITS

CUTTING MACHINES ARE FULLY INDEPENDENT MANUFACTURING UNITS. A LAMP SOCKET FOR POWER, A FEW GAS TANKS, A STOCK OF PLATES AND ONE OR TWO OPERATORS. THEY ARE READY TO PRODUCE INSTANTLY ANY HOUR, DAY OR NIGHT, WITHOUT ASSISTANCE FROM OTHER DEPARTMENTS. JUST CONTINUE WITH CUTTING AND PERHAPS WELDING AND BENDING. MANY CUTTING MACHINES ARE WORKED IN SHIFTS, SOME OFTEN 24 HOURS AT A STRETCH. CONCERNS WHO NEVER THOUGHT TO HAVE WORK ENOUGH FOR A MACHINE AT FIRST, SOON FOUND MORE THAN PLENTY, AND THEN BEGAN TO REVAMP THEIR DESIGNING FOR CUTTING.

VERY OFTEN THERE IS SOMETHING SUDDENLY WRONG AND A SERIOUS PROBLEM CREATED. IN ONE CASE 1700 STEEL CASTINGS WERE ALL FINISHED. IT TURNED UP THAT SOME SLOTS WERE MATERIALLY UNDERSIZED. JUNK THEM AND LOSE TIME TO RECAST THEM OR MILL THEM OUT? NO! THEY WIDENED THE SLOTS WITH THE CUTTING MACHINE IN A FEW SECONDS EACH WITH A SAVING OF A DOLLAR A PIECE OR $1700.00 NOT COUNTING ALL THE OTHER COMPLICATIONS. THE COST OF THE MACHINE WAS $2550.00. THIS ONE EMERGENCY ALONE NEARLY PAID FOR THE LARGE MACHINE AND THERE ARE MANY CASES WHERE MACHINES HAVE PAID FOR THEMSELVES WITHIN LESS THAN SIX WEEKS WITH REGULAR WORK.

MOREOVER THERE ARE RUSH AND ODD JOBS FOR THE PLANT OR FOR CUSTOMERS. THE OLD WAY WAS TO DESIGN, TO MAKE PATTERNS, TO CAST, TO FINISH, WHICH MEANT A WEEK OR TWO AND MUCH NERVOUSNESS BESIDES. NOW THEY JUST LAY OUT THE CONTOURS FOR MAKING TEMPLATES AND MARK THE STOCK TO BE USED. THE TEMPLATES TAKE LITTLE TIME TO MAKE, THE CUTTING MACHINE PRODUCES THE SHAPES INSTANTLY. THEY ARE THEN STRUCTURED TOGETHER BY WELDING AND MANY TIMES EVERYTHING IS READY WITHIN 24 HOURS TO RECEIVE THE ULTIMATE FINISH—AND THERE IS NOT MUCH FINISHING EITHER. AND THIS ALSO SHOWS THAT CHANGING DESIGNS IN WHOLE OR IN DETAILS IS NOW SIMPLIFIED TO THE UTMOST. WHAT CUTTING MACHINES HAVE ACCOMPLISHED BESIDES REMARKABLE COST REDUCTION IS:

INDEPENDENCE, READINESS, SPEED, FLEXIBILITY

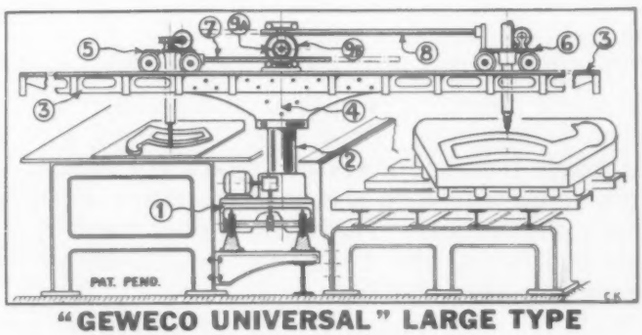
AUTOMATIC SHAPE CUTTING MACHINES

FABRICATION EXPANDING RAPIDLY

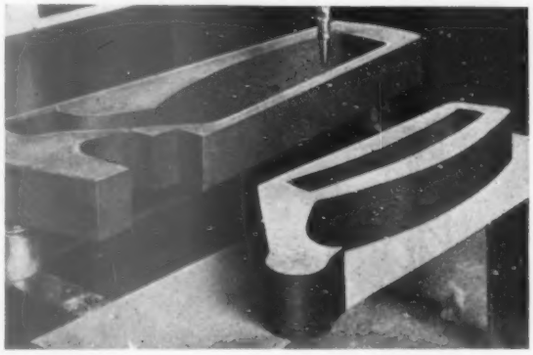
IN AUGUST, 1927, ONE LARGE FACTORY PUT IN THEIR FIRST AUTOMATIC SHAPE CUTTING MACHINE. IN MARCH, 1928, THEY ADDED TWO AND IN DECEMBER, 1928, TWO MORE. THEY ALSO HAD THEIR MACHINES CHANGED OVER TO CUT WITH 2 TORCHES, SIMULTANEOUSLY, WHICH DOUBLED THEIR OUTPUT. NOW THEY RUN THE MACHINES IN 3 EIGHT-HOUR SHIFTS WHICH TRIPLES THE OUTPUT ONCE MORE.

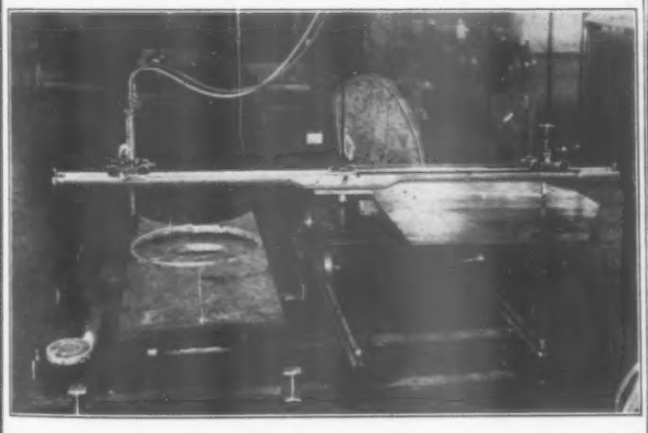
WHEN THEY STARTED FABRICATING THEY SHUT DOWN THEIR LARGE STEEL FOUNDRY, USED ONLY PART OF IT AND LEFT THE REST OF THE FLOOR SPACE TO OTHER DEPARTMENTS. NOW THEY WANT THE WHOLE SPACE BACK AGAIN BECAUSE THE REMARKABLE RESULTS WITH THIS NEW WAY OF FABRICATION URGENTLY DRIVES TO FURTHER EXPANSION. THEY ALSO PUT IN THEIR OWN OXYGEN PLANT BECAUSE THEIR COMBINED NEEDS CALL FOR MILLIONS OF CUBIC FEET OF OXYGEN. THUS THEY HAVE THEIR OXYGEN PIPED AND ON TAP AND ALSO REDUCE ITS COST TO ABOUT ONE-THIRD.

OF COURSE TO OWN AND OPERATE AN OXYGEN PLANT ONLY PAYS WHERE THERE IS A LARGE AND STEADY CONSUMPTION AND WHERE CONCERNS ARE SO FAR-SEEING AS TO SENSE THE NECESSITY OF ENRICHING THE AIR WITH OXYGEN EVEN FOR ORDINARY HEAT APPLIANCES, TO SPEED UP THEIR OUTPUT WITH AN INTENSIFIED, SENSITIVE AND FINELY ADJUSTABLE HEAT. OXYGEN BOUGHT IN THE MARKET OBVIOUSLY WOULD THEN BE PROHIBITIVE.

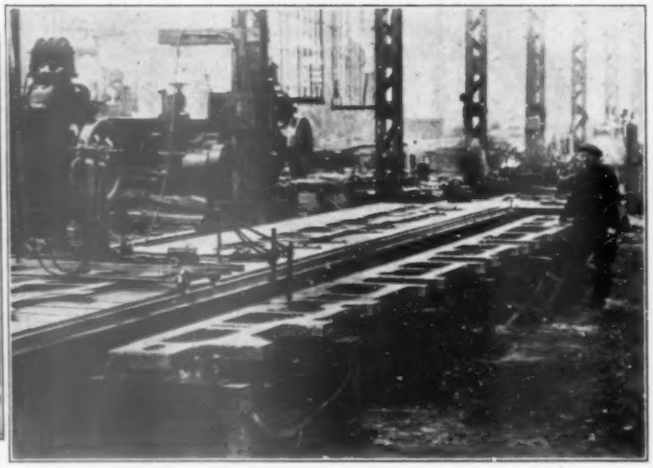


"GEWECO UNIVERSAL" LARGE TYPE





"GEWECO UNIVERSAL" Set for Circular Work.



"GEWECO CROSS CARRIAGE" 45 Ft. Long. Built by Griesogen, Frankfort/Mein for Europe.

A SPECTACULAR FIELD FOR OXYGEN MANUFACTURERS

AUTOMATIC CUTTING MACHINES CAN PRODUCE A PILE OF WORK AND OBVIOUSLY USE UP OXYGEN. A FABRICATION MACHINE GOING STEADY FOR WEEKS MAY EASILY USE UP 4000 TO 8000 CUBIC FEET A WEEK, OR 200,000 TO 400,000 CUBIC FEET A YEAR. THIS MEANS A STEADY, CONCENTRATED OXYGEN SUPPLY WITH EXCEPTIONALLY QUICK TURN OVER OF TANKS—IN SHORT THE BEST KIND OF TRADE IMAGINABLE. THEREFORE THE OXYGEN MANUFACTURERS SHOULD HAVE A VITAL INTEREST TO ACQUAINT THEMSELVES AND THEIR CUSTOMERS WITH MACHINE CUTTING TO GET A GOOD TRAINING AND HAVE DEMONSTRATION MACHINES IN THEIR PLANTS. THIS WILL CREATE A STEADY SOURCE OF INCOME AND MUCH GOOD WILL FROM THE ULTIMATE USERS. BUT THE GAS MANUFACTURERS HAVE TO DO THEIR PART.

TO BE CONTINUED.

Quasi-Arc

Specially-Covered Welding Rods
and Equipment for Electric Arc Welding

The picture below shows part of a long transmission line, carrying 75,000 volts, all masts welded throughout with Quasi-Arc Electrodes. One of the 87-foot masts (weight, 3000 pounds) was tested to destruction, AND NOT A SINGLE WELD WAS FRACTURED. Quasi-Arc welding was chosen for this job because of its economy, strength, and high resistance to corrosion.

Quasi-Arc Welding Rods are entirely unlike ordinary bare or paste-covered rods.

The chief difference is in the **covering** of the Quasi-Arc Rod—an asbestos yarn covering, impregnated with a chemical, spirally wound around the rod.

The use of Quasi-Arc Welding Rods, especially for work requiring welds of unusual strength, is by no means new. They have been used with remarkable success for **sixteen years,** for everything from repair work to rivetless structural steel and ship construction. They are widely used in foreign countries, and their use in this country is increasing very rapidly.

Welding with Quasi-Arc Electrodes is the process of today and of the future, because—

1. **Lower Cost.** Labor cost, with Quasi-Arc Rods, will average **substantially less** than with ordinary welding rods. This and other economies, including a one-third saving of current, makes Quasi-Arc Welding substantially less expensive than ordinary welding.

2. **Better Welding.** The Quasi-Arc weld is uniformly stronger than welds made with ordinary bare or paste-covered rods, and the quality of the weld is not so entirely dependent upon the skill of the operator; in fact, the human element is practically eliminated.

These are broad claims, but we can prove them, **in your own shop,** and will gladly do so without obligating you in any way. Write for complete information, and let us arrange for a practical demonstration.

QUASI-ARC INCORPORATED

11 West 42nd Street, New York

CLEVELAND CHICAGO DALLAS LOS ANGELES

Pipe Welding Under Difficulties

Welders Obliged to Exercise Ingenuity in Overcoming Mechanical Problems of Welding Pipe Line in Tunnel

By G. F. Walker

AN interesting job of welding was recently completed at the plant of the Bigelow Hartford Carpet Co. at Thompsonville, Conn., one of the largest manufacturers and producers of carpets and rugs in this country. The sizes of the pipe lines welded were 20-inch, 14-inch, 10-inch and 8-inch runs, and nozzles welded on ran from four-inch on the six-inch line to 14 inches on the 20-inch line.

There were many difficult problems to be contended with on this installation, among them being the fact that the 20-inch line had to run through a tunnel almost 900 ft. long which already was congested with nine lines already installed there.

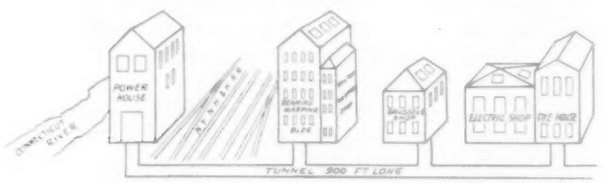


Fig. 1. Sketch of Location of Pipe Lines.

It was impossible to turn the pipe or to find access around the pipe to weld in a stationary position, so after much thought and deliberation it was decided that by cutting holes into the tunnel (two of them) to accommodate a length of pipe it could be drawn along and another length lowered into place and welded until a length was constructed long enough to reach half the distance to the holes where the expansion joints were to be located, and as openings had to be made to allow the installing of the expansion joints, vanstone ends were welded on to the ends of the long runs here and this allowed these lines to be tied in without much difficulty.

A piece of bar iron (Fig. 2) was welded inside of the first length of the run and this allowed a pull on chain blocks which were rigged up for the purpose. This could not have been done

Figure 2.

Bar Iron 1½ inches in diameter bent and welded into first end of pipe for securing hook of chain blocks for pulling lengths of pipe along through tunnel. Reason for doing this was because there was not clearance enough in places to remove outside hitches. As fast as a length was lowered into hole and welded it was drawn along until next length was put in place and welded and the same procedure followed until the next hole was reached.

otherwise, owing to very cramped and close working conditions. Of course these bars were cut out of the pipe before the tie-in welds were made.

There were several bends and turns in this tunnel and to make these welds it was rather hard and difficult. A mirror had to be used to see to advantage and I might say here that should any of my readers at any time get stuck, as far as a mirror is concerned, a pail of water placed in an advantageous position will allow you to see the reflection of your work so that you may proceed with the knowledge that should any metal fall while you are welding it will not crack your mirror as it will the glass.

The lengths of 20-inch pipe and other sizes were distributed at various places about the different buildings in such manner as to be advantageous to handling and lowering into the tunnel at the openings. These lengths were handled on trucks and dollys

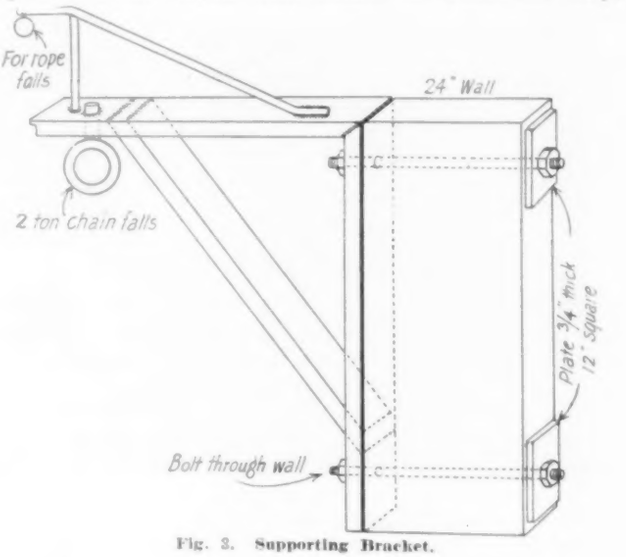


Fig. 3. Supporting Bracket.

pushed through the alleys of the different rooms without incident. Because of careful handling and manipulation not a single loom or other piece of production machinery was stopped on account of this operation.

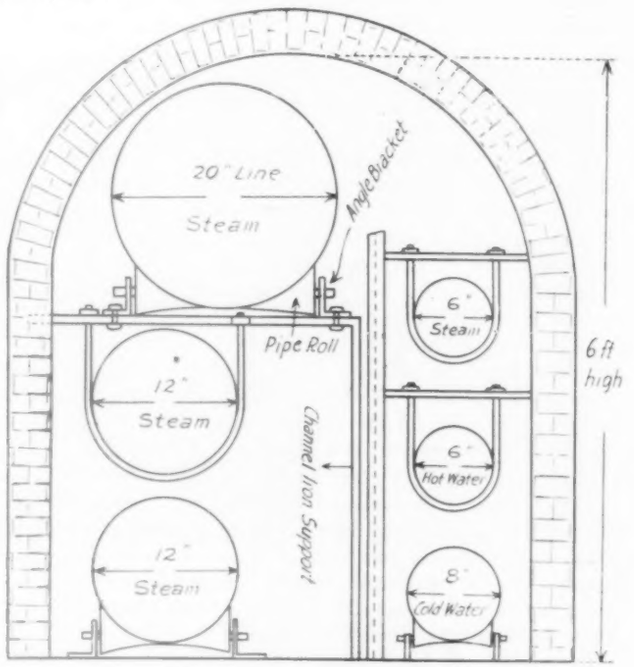


Fig. 4. Cross Section of Tunnel.

In the power house our work was very difficult, owing to the fact that where our 20-inch line came up out of the tunnel it rose to a height of 65 ft. and ran along a wall very close to the roof

trusses for a distance of about 160 ft., then made a 90 degree turn to the turbine room over the tops of the boilers and then dropped down 72 ft. to the under side of the turbine.

Putting up the lengths of pipe in the boiler house incurred quite a hazard, as there were coal lorries operating back and forth, filling the hoppers with coal, and the exposed power wires were in close proximity to the pipes as they were hoisted in the air. It required a great deal of rigging and snubbing, etc., to get these up without accident, which fortunately was accomplished.

Owing to the tremendous weight already on the roof trusses, we were not allowed to hang any tackles of any kind on them, so we devised a bracket of channel iron, all welded, with a large eye welded on the end for hanging a falls and two holes 1¼ inches in diameter for allowing 2 bolts 27 inches long to go through the wall from inside to outside. In this we hoisted our pipe in the air. The small ring and bar bracket (Fig. 3) were for hitching on a rope falls with which the chain falls was hoisted into place and hooked in the larger ring underneath. We used four of these to very good advantage.

This job was tested out O. K. and is now operating, giving wonderful results.

RESEARCH IN WELDING*

During the past ten years more money has probably been spent in research work on welding than on any other industry in proportion to the total investment or to the gross income of the industry. If we believe that progress depends on accurate knowledge, is it surprising that this comparatively new method of fabricating metals is advancing steadily toward the place it should occupy in our industrial civilization?

There is little need for me to discuss the laboratory investigations which are in progress and the effect which they may have on welding in the future. You get this information frequently from men who are closely in touch with these experiments and can give you vivid accounts of their failures and their successes.

Like the mills of the gods, the experimental laboratories grind slowly—all too slowly many of you think—but there are other influences which by comparison work like chain lightning. They are the influences which change the mental attitude of large masses of people and the course of human events into new channels for all time. The crusades during the Middle Ages to wrest the sepulchre of Christ from the infidels are a striking example of these almost irresistible movements.

In studying these movements it is important to determine when the ideas which started the movement were first discussed. Columbus discovered American in 1492, but the movement started when enough people were convinced that the earth was round to keep his scheme and its alluring possibilities before the public. When that was done, someone else would have discovered the New World if Columbus had, for any reason, dropped out.

We would like to draw your attention to a movement in welding during the past year which has some of the elements of the crusades. It has caused a change in mental attitude which is astonishing and seems to be spreading fast. Where it will stop and what the effects will be none can foretell.

This movement is the preparation of procedure specifications for welding definite structures—specifications, which given the dimensions of the structure and the material from which it is to be built, prescribe in detail the apparatus, welding rod, qualifications of the operator and the methods of welding. They are an attempt to put into print the knowledge and something of the skill which distinguish the expert craftsman from the tyro.

In preparing any specifications it is considered desirable, whenever possible, to require a definite performance for the commodity. Only when this is impracticable is it good practice to specify the method of manufacture or the material. Performance requirements leave the doors wide open for improvements in material and in methods of manufacture. For example, it is good practice to require a minimum ultimate strength of 60,000 pounds per square inch for structural steel, but undesirable to require that the steel be made by the open-hearth process because steel made in the electric furnace would not meet this requirement, although it might be much better.

In so far as procedure specifications fix the minimum properties for the test welds made to determine the ability of the welder they are performance specifications. On the other hand, requirements fixing the welding rod, preparation of the welds and the apparatus to be used are undesirable. These requirements should be used only if there is no other practicable way to insure that the welds will be satisfactory. Requirements such as these, on the method of manufacture, are an admission that we know that the methods specified will produce welds which are satisfactory, but that we lack definite information on the properties produced by other methods.

Perhaps sometime we shall have a practical test for completed welds which will allow us to separate good from bad welds, but at present there is no way to determine the physical properties of welds except by loading them to destruction in a testing machine.

At present, therefore, the use of procedure specifications for welds which definitely prescribe the methods to be followed in making the welds are justified and so far as we know are the only way to insure satisfactory welds in commercial work.

Welding procedure specifications have been prepared by the Pressure Vessel Committee and the Structural Steel Welding Committee of the American Bureau of Welding for the investigations now being made by these committees. The boiler Code Committee is very much interested in the investigation of welded tanks, as the results will be of great value in revising the Unfired Pressure Vessel Code.

In all of this work the organizations interested in oxy-acetylene welding have taken a leading part. For an investigation of the strength of welded joints in tubular aircraft structures procedure specifications for making the welds by both the oxy-acetylene and the electric arc processes were to have been supplied by the American Bureau of Welding. The procedure for oxy-acetylene welding was completed some time ago, but little has been done on the electric procedure and it is likely that on this account no electric welding specimens will be tested in this investigation. The oxy-acetylene procudeure has received much favorable comment and many requests for copies have been received.

We must all keep clearly in mind the fact that the value of welding procedure specifications has never been proven, and is not the result primarily of research work. They are the result of a sincere effort on the part of welding experts to insure satisfactory welds for the public.

Although it is evident that research is essential in obtaining the information necessary for welding procedures, the wide use of procedure specifications in the past year and their acceptance both by makers and users of welded structures is so astonishing that it bids fair to revolutionize the industry.

Welding procedures have such boundless possibilities both for good and evil that everyone interested in this newest method of fabricating metals should use his best efforts to make them serve their purpose.

Reprinted from the Report of the Oxy-Acetylene Committee of the International Acetylene Association, 1928.

CANADIAN SECTION HOLDS SPRING MEETING

The Canadian members of the Compressed Gas Manufacturers' Association held their spring meeting at the Lakeview Golf and Country Club, Toronto, Ontario, on Tuesday, June 11th, 1929. The members assembled at the Old Colony Club in the King Edward Hotel at 9:00 a. m. From there they drove to the country club where golf specialties, such as putting and driving contests, were held. At 12:30 p. m. luncheon was served, followed by the usual business meeting, conducted "over the table." The afternoon was devoted to a golf tournament with appropriate prizes for all contests. Quite a number of the members of the association and their friends were in attendance at this meeting.

Design of Welding Jigs and Fixtures*

Why Jigs Are Necessary in Production Welding—The Characteristics of a Good Welding Fixture—How to Design Them

PRODUCTION operations in many types of articles and materials are greatly aided by the use of jigs. Jigs are special fixtures or machines designed to hold the part on which the operator is at work. In the field of welding their use has been advantageously utilized for a long time and many operations which would otherwise take a great deal of time are speeded and facilitated by means of carefully designed and efficient working devices, which make possible additional savings in labor and material costs.

The main reason underlying the use of jigs for oxy-acetylene welding and cutting operations is economy. Usefulness of jigs is best shown in standardization of production output

Fig. 1. Cast Iron Faces Conduct Extra Heat Away.

of large numbers of similar parts. Jigs simplify processes of assembly and relieve the operator from all extra work which does not come under the head of actual welding. The result is that savings are gained through the regularity and correctness of the welded parts and through economies in speed and cost of manufacture.

Regularity of welded parts comes with the concentration of the welder's attention on the one operation which he is assigned to do; the work becomes a habit and he gets greater production through greater speed.

Facilities supplied to the operator for handling the work easily and conveniently have a decided influence on the output. The quality of the work will be improved, and there will be a marked decrease in the amounts of gases and supplies used. When jigs are properly designed so that the operator is given an easy position to work in, fatigue, one of the great enemies of efficiency, is lessened, aiding also the morale of the workers and resulting in less idle time, happier workers, and consequently better articles.

Jigs can often be loaded and unloaded by helpers or by workers whose function it is to move work from one welding station to the other. Here is another distinct saving; the welder spends all his time on actual welding thus cutting down the expense of having the higher paid workman stop work to perform duties better fitted for the helper.

With properly designed jigs the fitting is automatic. If there is contraction or expansion to be allowed for, the jig takes care of it as part of its operation. And there should be attachments to prevent improper insertion of the pieces to be welded. With automatic fitting and with careful inspection of the seams the merit of the finished product increases accordingly. The jig acts as a gauge for the size of the article and assures uniformity, an essential factor when parts are to be later assembled into larger units. Rejection of welded parts amounts to almost nothing, especially when there are devices to prevent improper insertion; this feature eliminates many of the drawbacks which are sometimes found in old style fixtures.

Fig. 2. Jig Permits Speedy Welds.

The final advantage comes under the head of speed. If there is only a small gain in the actual speed of one welding operation, this gain multiplied by several operations and by many repetitions is the factor which makes up the final accumulation of savings. The speed gained is always governed so that it will be consistently high without incurring the possibility of careless work. In machine operated jigs the mechanism has devices to control the speed of operation.

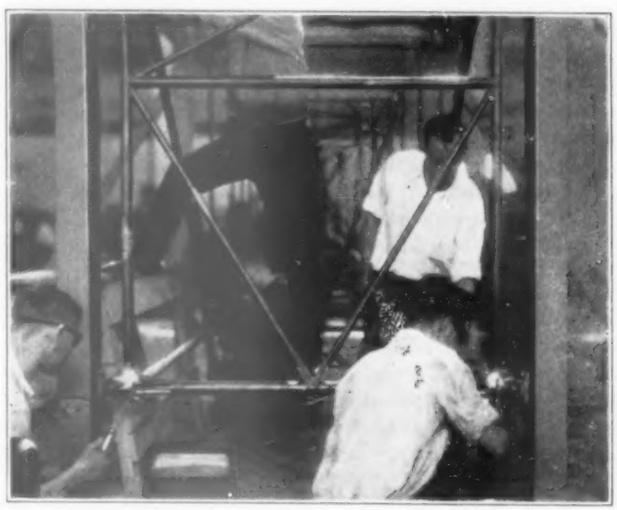


Fig. 3. Angle Iron Jig For Aircraft Welding.

Another reason for the increase in use of jigs in welding operations is the fact that many of them can be made in the shop using the oxy-acetylene cutting and welding apparatus. On jigs with angle iron framework, the parts can be cut by means of the oxy-acetylene blowpipe, and can be welded together. Some jigs using large metal sections such as heavy

*From "Oxy-Acetylene Tips," by courtesy of Linde Air Products Co.

plates to conduct heat away can be cut from rolled stock by means of the oxy-acetylene cutting blowpipe, the members can then be welded together so that they form a sturdy and rigid framework for the welding operations. Angle iron jigs are extensively used for aircraft welding (Fig. 3).

Jigs, as used in welding, perform two distinct functions. The first is to hold the pieces firmly in correct position for high quality welding so that warpage or buckling will not occur.

Fig. 4. Simple Jig for Pipe Specials.

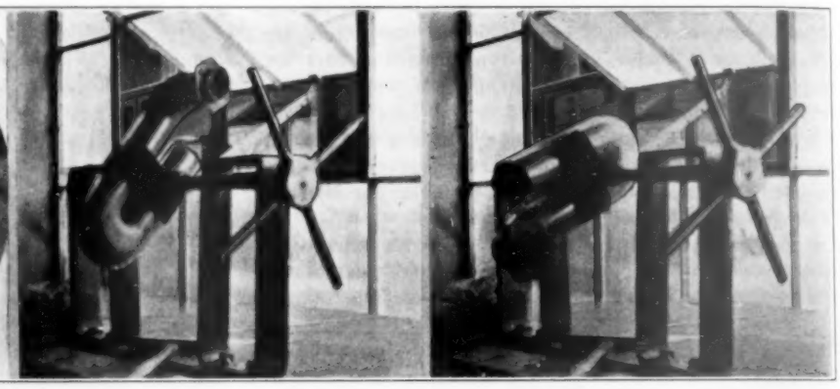


Fig. 9 & 10. Revolving Jig for Welding Auto Heaters.

The second, a development of the age of rapid production of similar parts, is the use of a jig for the purpose of completing the work in the quickest possible time.

In designing a jig to fit a special application of welding all the following items should be kept in mind as the basis for the ideal welding jig and as many as possible of these features should be included in its makeup.

An efficient welding jig should:

1. Hold the work pieces positively in position.
2. Be made so that the work can be quickly inserted and removed.
3. Make impossible the insertion of the work piece in any but correct position.
4. Provide devices for rapid and steady clamping and adjusting without undue effort.
5. Allow no spring in the work piece from clamping operations.
6. Allow no buckling, warpage, or other distortion from expansion or contraction due to the heat of the blowpipe.
7. Permit inspection of the weld if necessary.
8. Be easily cleaned, and have faces which will hold without marring the work.
9. Be as light as is consistent with the rigidity and strength necessary in such equipment.
10. Be easy to handle and not unwieldy.
11. Be safe under any and all circumstances.
12. By its construction or location, permit the operator to work without any undue inconvenience or unnecessary fatigue to the blowpipe operator.
13. Be movable, if possible, so that all seams will be made in a horizontal position.

In designing a jig, the first thing to be taken into consideration is the size of the part to be welded. The size of the jig must be based on the size of the finished product with sufficient clearance for correct insertion of the part without danger of warpage, slipping, buckling or vibration, within limits of tolerance which can be set down or figured out beforehand. In general, these tolerances should be as liberal as possible and consistent with the accuracy necessary for the proper fitting or functioning of the article or part. If the measurements are too rigidly adhered to and tolerances are made too low, the result will be a higher cost of production because it will be necessary for each workman to take more care with the work than is absolutely necessary. Since the jig is ultimately designed to increase production it can be seen that this matter depends upon the adjustment of the tolerances to liberal limits.

An actual size specimen of the article to be welded should be used as a basis for the design of the jig. The seams on the specimen can be located wherever they would come in actual welding as performed most comfortably and easily and the design for the work holding devices or clamps should be decided upon. Allowance should be made for the possibility of visual or other inspection or testing of the welded part while in the jig; this may be very important and a complete testing operation may be sometimes saved by just this small change in the construction of the jig. Where there are several seams to be welded, the several positions should be carefully studied and so grouped that the shortest time will be taken for their completion and the order in which the seams are worked upon will be such that this item in itself will take part of the assembly work and will avoid some of the unit movements of other systems (not using jigs) which make them less effective. The welding operations should previously have been carefully grouped and arranged to present the best possible order for completion and they should also have been reduced to as few operations as possible.

Fig. 5. Jigs for Pipe Welding in Use.

The method of forming the framework should next come under consideration. This brings up the question of what material should be used in the construction of the jig framework proper. In regulating the amount of contraction and expansion this matter is found to be quite important. Sometimes a couple of heavy bars or scrap rails along the seams may be sufficient to control expansion and to hold the parts in alignment at the same time. This primitive idea can be enlarged upon to the extent of having clamps or fastenings to hold the parts to the bulky part of the framework which conducts or absorbs the heat.

Cast iron frameworks are often found to be desirable when there is a necessity of controlling the heat. A heavy plate of cast iron as a base will quickly conduct away all extra heat and allow the welding of the parts with the least possible amount of warpage.

A jig of this type is shown in Fig. 1. The arbor press is made of cast iron which sets flat upon the top of the metal,

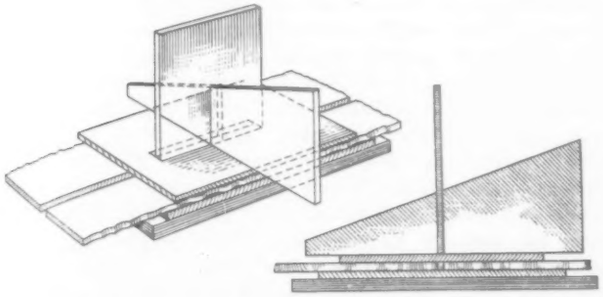


Fig. 6. Wedge Type of Fastening Used to Hold Parts in Position.

absorbing the heat and holding the seam in alignment at the same time. Similar holding frames are used on the sides. Fig. 2 shows another view of a jig of this type in use. Often the jig takes the form of an indentation or hollow between two large castings which hold the two parts in position and at the same time take away the heat.

Angle irons and C-clamps are found useful in operations where there are to be but few repetitions of the seam. In aircraft fuselage welding the most common type of jig is one made up from angle irons as shown in Fig. 3.

In considering the makeup of the jig framework, it is of primary importance to see that the matter of contraction and expansion is taken care of. Sometimes it may be necessary to use water-cooled jigs in which a stream of water is constantly passing over the metal a short distance back from the seam on which the welder is at work.

Next for consideration comes the type of device used to fasten the parts into the framework decided upon.

There are a number of general means of holding the workpiece in position. These consist of: (1) pegs, wedges or vee blocks used in connection with a special work table; (2) all types of fastenings using screws, thumb screws, set screws, clamps, etc.; (3) all types of devices using springs; (4) any pneumatic means of holding the work in position; (5) clamps worked by means of cams.

The first type of means for holding workpieces are of course used to a great extent in repair work, but when used in production work, they are usually replaceable by some other means which will be quicker and more efficient for the work to be performed.

Typical of vee block use is the device, Fig. 4, employed for holding pipe specials in process of manufacture. This is made from a section of scrap pipe; the vee is cut out by means of the oxy-acetylene blowpipe. Two of these are used to hold a large pipe header while the risers or flanges are being welded in position, Fig. 5. In this type of work specialization is the rule; use of such a simple device might not be at all efficient for routine production of similar parts.

Under the first heading come wedges and pegs of all types and also heavy members placed in such a way as to support the work. Pegs slipped into holes in a welding table serve for temporary work where only one part of a kind is to be welded or where the metal to be worked on is very thick and there is not too much care to be taken in the repair. Wedges will hold the work piece more firm than simple pegs. A wedge is also utilized in the modified H-clamp shown in Fig. 6. V-blocks, carefully mated and leveled, are used for shafting, or heavy round members.

Pneumatic devices using either suction or compression as a medium for the tightening of the jig are generally only economical when compressed air is available in large volume at low cost. Pneumatic devices are also complicated and useful in most cases only as a means for holding small parts. Usually other means of holding the part are available and rule out this means for holding parts except in some exceptional cases. Spring devices are sometimes used to hold small parts. As auxiliary parts of jigs they are sometimes used to compensate pressures exerted by other clamping devices and to expel or help to remove the finished welded article at completion of the work. The fault found with springs as used in welding jigs is that they do not hold the

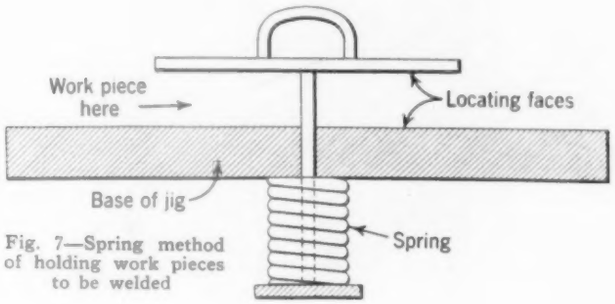


Fig. 7—Spring method of holding work pieces to be welded

workpiece tight enough to prevent distortion due to expansion or contraction.

Where the contraction and expansion question can be disregarded, springs are speedy and efficient. An example of this is a ring of flat metal to be made from two semi-circular members. This device shown in Fig. 7 shows a spring can be utilized for these joints in production.

Screw fastenings for holding the work are most common. The primary type here is the H-clamp which can be made up with straight, curved or angular faces. It consists of any two pieces of metal (the faces) which are fastened together with a bolt on which is a thumbscrew or other hand fastening device of that principle. Practically all other applications of this principle are based on the primary feature, the H-clamp.

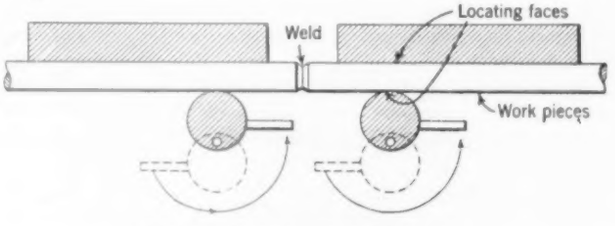


Fig. 8. Cam-clamps Used in Jigs.

Cam clamps all work on the general principle of a clamp having an eccentric circular part bearing on a central pivot. The work piece is inserted when the smaller part of the cam is toward the member and then the cam is revolved until the work is gripped firmly between the fixed bearing and the cam. A diagram of a fastening of this sort is shown in Fig. 8. Variations in this type of clamp are found particularly useful in combination with other types of clamping devices.

The matter of combining several methods of clamping is admirably suited to some jig operations. This is especially true in jigs of the interchangeable type which are designed to take work pieces of different sizes. A combination jig using screwed fastenings in addition to other means of fastening is shown in Fig. 11.

This jig is so designed that it will accommodate tanks of various sorts. The various arms can be removed if found unnecessary for the type of work under the blowpipe. When the arms are used, the ends of the arms can be adjusted to

any length by means of the extension device. The faces of the arms are removable so that if a cylindrical tank is being worked upon, a face to accommodate the curved surface can be attached; if the sides of the tank are square, the faces illustrated are used. The tack welded parts are placed outside the jig and the arms are then screwed up to hold the metal in line. This produces a jig which is almost universal in its applications for tank manufacture, being useful for almost any design.

In most cases where production warrants it, it is better to design and manufacture a special jig for every welding job rather than jigs which will be interchangeable. Some

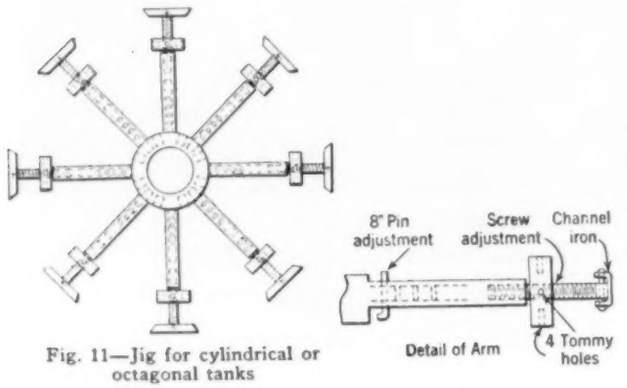


Fig. 11—Jig for cylindrical or octagonal tanks

plants, however, prefer a jig which will hold the part to be welded in any position so that all the jigs are essentially the same with different sizes of clamping jaws or fastenings.

The feature of this standardization is that when one production operation has progressed so rapidly that there can be a let-down, the operators can be assigned to another very similar operation which is lagging in production, thus saving them from being idle, and the firm from falling behind in that specific operation, and consequently in production in general.

The faces of the clamps are vises in which members of a welded article are to be held and should have lead faces or be finished some other way so that they will not mar the surface of the metal which is to be worked upon. Vises with vee-shaped or rounded jaws are helpful for holding tubular members.

In designing jigs it is advisable to predict the effect of the contraction and expansion of welded parts and in most cases there are reasons for so locating fastenings that will hold the members to be welded, not in the position which they will assume after welding but in a position so regulated that the contraction after welding will draw them to the proper angle or alignment. Thus in making an angle joint, the jig is sometimes constructed so that a little gap is left on the inside of the angle. The weld starts on the outside and the gradual contraction draws the parts to the correct angle. This device might be called a corrective type of jig.

If there are several operations to be accomplished, as many as possible should be carried out on one jig. It is suggested in some cases where the part under construction consists of two or more operations on metals of different sizes, that the first operation be made on the lighter gauge metal. After completing this seam, with the same blowpipe and without any change of head, tack welds can be made to hold the thicker parts in line. The final welding work on the heavier metal is done by another operator with the correct size welding head. It is sometimes feasible to have weldings jigs on which two or more operators will be at work at the same time, thus saving time to change work pieces.

All small parts such as clamps, pegs, springs, nuts and wrenches used in regulating the jig should, if possible, be permanently attached to the body of the jig to prevent their being mislaid or lost. These fastening attachments should be made up from standard size articles whenever possible so that in case of loss or breakage they can be replaced immediately. If there are several nuts to be fastened on one jig they should all be the same size to avoid changing of wrenches.

It is always desirable to have a jig the fastenings of which can be easily removed and put out of the way when it is time to remove the piece which has been welded. In smaller jigs there is little trouble met with but some larger jigs must be taken entirely apart to remove the completed article; this is sometimes the case in aircraft fuselage construction.

Various means are taken to get the jig ready for insertion or removal of the finished part. Jigs which are set upon tables usually have several locating points with fastenings which must be adjusted before removal. Sometimes the entire top of a jig must be taken away; in this case large arbor presses are used or in other operations counterweights make possible speedy and easy removal and insertion of work pieces.

Movable jigs involve many useful devices. The simplest form is a hand turned jig which the operator moves along in order to get the seam in the correct position for welding. Refinements of this crude type involve moving tables or benches upon which small parts are located, and machine actuated jigs. The hand turned or moved devices are most common and all that is necessary to include this feature in the design is a pivot or moving platform which will locate the seam correctly with least possible effort. An example of a jig of this sort is seen in Fig. 9. This jig is used in the manufacture of automobile heaters. The two parts of the heater are put in the jig which is counter-balanced to hold it in position. After welding, the jig is turned over and the second seam is welded in the horizontal position, Fig. 10. Movable tables of this sort are so easily made that they should be a part of almost every jig for production work.

Other adaptations of the movable jig include jigs which have two or more types of motion. A jig used in welding refrigerator units is of this type. The part to be welded is a rather complicated tubing and cylinder assembly, and the welds on this single unit total 52, a great many of which are so located that it is a difficult matter to make the joint unless the unit is held in the proper position.

The jaws for holding the unit in alignment are of the vise type, and the vise is mounted on two swivel joints, one to allow rotating on a vertical plane, the other to allow rotating on a horizontal plane. These swivel joints are held in the position required by means of a cam clamp attached to each one. Thus with this type of jig it is possible to hold the unit in any position. By making a few adjustments the operator can be sure of having all his welds made in a horizontal position.

The movable jig is especially fitted for the making of continuous welds along circular lines. Thus for the welding of ends on small cylindrical barrels the piece is placed on rollers to which a rotating movement is transferred by means of a pulley drive put into action by a pedal. It is unnecessary to point out the advantages which this type of jig gives in production welding.

There are also a group of jigs which have been found very satisfactory for certain production operations. These are jigs moved automatically. The only difficulty to be overcome is this: The same welding work being given to a number of workers, how is it possible to convey by mechanical means to all the pieces a uniform movement so as to obtain throughout the same speed of welding? The solution is to set the jig for the highest speed possible that an operator experienced in this specific work can attain in producing a clean weld satisfactory for acceptance by inspection or test. All the parts are now placed in the jig and all move at the same speed, which has been determined as above and this high rate of

speed keeps the operators moving as rapidly as they can make good welds.

But all the operators may not be able to keep up with the speed imposed or some of them may produce incomplete welds or welds of poor quality. To overcome this difficulty a retarding mechanism is provided consisting of a simple foot brake acting on the roller pulley which permits disconnecting this from the power shafting, the belting sliding over the driving pulleys. If the part moves too fast for the welder, if some unexpected incident happens, when it becomes necessary to change the welding rod, the welder has only to press the pedal to prevent the weld from moving. In a short time it is remarkable to see how few welders find it necessary to use the brake. Those who appear the least rapid speed up to attain the fixed speed and at the same time control of the quality of the joint can always be taken care of. Quantity production should under no circumstances be obtained at the expense of quality.

UNION CARBIDE RESEARCH BUILDING FABRICATED AND ERECTED BY OXY-ACETYLENE WELDING

Oxy-acetylene welding is being used exclusively for fabricating and erecting the 300 tons of structural steel required for the framework of the Research Building now under construction at the Niagara Falls plant of the Union Carbide Company. This is a mill-type structure with a single aisle and mezzanine operating floors, 75 ft. wide by 260 ft. long and 42 ft. 5 in. to lower chord of the trusses. A full-span, 10-ton travelling crane runs the entire length of the building. This is the largest gas welded structure.

The building was designed and erected in accordance with the Niagara Falls Building Code and the American Welding Society Code for Fusion Welding and Gas Cutting in Building Construction, Part A, Structural Steel. Fabrication and erection are being carried out under usual production procedures.

Design for the oxy-acetylene welded construction was developed by the American Bridge Company under the direction of James H. Edwards and H. M. Priest assisted by J. Leahy and H. H. Moss of the Development Section, Engineering Department, The Linde Air Products Company. General design was under the direction of H. L. Noyes, Chief Engineer, Union Carbide Company.

Steel was fabricated by the American Bridge Company at their Trenton shops. H. E. Rockefeller and M. J. Wall of the Development Section, Engineering Department, The Linde Air Products Company assisted in direction of welding during fabrication and are also supervising the field welding.

The building is being erected by George C. Holcomb of Forestville and Buffalo, N. Y.

A program of inspection of the building has been planned for June 19th, at which time many prominent engineers and architects interested in structural welding will attend. Welding will be in progress so that all phases of the work can be studied. A description of the general character of the welded structure will be given and motion pictures, illusarting typical details of design and fabrication, will be shown.

It is expected that the framework will be almost completely assembled and bolted and that the field welding will be about one-half completed at the time of the meeting. A column and truss, each completely fabricated, will also be on the ground to permit closer inspection of details.

ARC WELDED SPIDER

The arc welded spider or rotor shown in the accompanying illustration is representative of the extensive application of the electric arc in the manufacture of machinery parts. This large spider is for use with a 45,000 kv-a., 150 rpm., vertical waterwheel AC generator, also of the welded construction, being manufactured by the Westinghouse Electric & Manufacturing Company for the Aluminum Company of America. The complete machine will be installed in the plant of the Knoxville Power Company, Knoxville, Tennessee.

Rotor for Large AC Generator Arc Welded.

The construction is entirely of rolled steel shapes, fabricated by the electric arc welding process, weighing 60,000 pounds. The welded construction made it possible to effect approximately 25 per cent savings in weight over an equivalent cast construction.

The bare spider, as illustrated, is 16 feet high, and 4 feet, 4 inches wide at the rim. The total weight of the complete waterwheel generator will be approximately 450,000 pounds.

Low carbon mild steel $\frac{5}{32}$ inch welding wire and Westinghouse 300 ampere, DC-DC, single operator arc welding sets were used in the fabrication.

HE'S BOUND TO BE A WELDER

The accompanying illustration is from a photograph of Gus Gehlert, Jr., the husky son of Gus Gehlert who is one of the old time welders of San Francisco, Calif., and has a shop of his own in that city. The youngster is shown repairing a milk can and shows every evidence of being interested in the job. The sign indicates that he intends to be a real welder when he grows

Gus Gehlert Jr. in His Dads Footsteps.

up and wants to have some documentary evidence to show that he has been at it all his life. Mr. D. J. Will of the Stuart Oxygen Company of San Francisco, states that Gus was two years old when this picture was taken. "The boy is now five years old," he says, "and did a rather good job of soldering while I was at the shop, which shows that it pays to start them in young."

AN ALL WELDED SPEED BOAT

A resident of Chicago who is an outboard speedster enthusiast had been encountering trouble with his boats breaking up under the heavy pounding of the waves while traveling at high speeds. When speaking of this difficulty to a friend of his who is an official of the Beckwith Iron Works, it was suggested that they could build him an all welded boat made up of light steel parts. This suggestion was accepted, so the above company got in touch with Mr. W. A. Owen of The C. H. Hollup Corp., and with his

Top View—Mr. Owen Welding.
Lower Views—Show Shape of Boat.

advice and extensive help they proceeded to lay out and then weld the boat.

The frame was made up of 1-in. by 1-in. by ¼-in. angle iron and all joints were arc welded. That part of the job was not very difficult, and was done by the shop welder. But when it came to welding on the 16 gauge sheet steel, the difficulties of preventing buckling presented themselves. The accompanying photographs show the expanse of the sheet steel and the shape of the boat. Mr. Owens tackled the job of getting the sheet metal on with a minimum of buckling and succeeded very well.

The boat, as can be seen in the pictures, is a small affair made somewhat in the shape of a wedge with a bow line horizontal to the water, and presenting a flat surface on which it floats. Before launching, a fin about a foot long and extending nine inches deep is slipped into a groove which is welded to the center line of the forward quarter of the boat. This fin extending down into the water prevents side slipping. The boat is stepped off in a 2-inch step 4 feet 6 inches back from the bow. Its over-all dimensions are 10 ft. 9 in. in length and 4 ft. in width. It has a depth of about 14 inches at the step. Its total weight is a little over 350 pounds.

When tried out, it acted very well, even in a rough sea. The outboard motor representative suggested that the stern should have a forward slant from top to bottom instead of the straight drop with which it had been made. He thought it was too bad that it had been made that way, but the builders did not think so. They loaded the boat on a truck, and took it back to the plant. A few cuts with the torch and the stern was off, a few more cuts and the end had been trimmed properly, then followed several minutes of welding, the stern had acquired the right slant, and the boat was ready for the water again. Such are the advantages in making alterations on the welded product. The boat is now being painted and the owner expects to do some racing with it during this summer.

STRUCTURAL TESTS AT RENSSELAER

That electric arc welding may now be applied to the erection of structures of all kinds and sizes is the conclusion reached as the result of the completion of a two years' series of tests on welded joints. These tests, made at the Rensselaer Polytechnic Institute under the supervision of Professor T. R. Lawson of the department of civil engineering, are analyzed by Andrew Vogel in an article, "Tests of Metal Arc Welds," appearing in the General Electric Review for June.

The result of these tests, Mr. Vogel points out, is to indicate that the application of electric arc welding to the construction of buildings is no longer in the experimental stage, and that this application may now be made with complete safety and with entirely successful results. The results are summed up as follows:

The uniformity of the results of the large number of tests made on specimens prepared by many welders producing only such welds as are regularly used on production or construction work, proves that welding is no longer in the developmental stage, but can now be assigned to a definite place in the structural steel industry. All welding was performed in a routine manner, so that the tests would be a true index of the strength to be expected on ordinary building construction work. No special requirements were established nor were any special precautions taken to improve the quality of the work. The only rule followed was that a weld once started was continued to the end of the weld. The electrodes used were ⅜-inch electrodes regularly used on production or construction work and the current did not exceed 200 amperes. A General Electric portable arc-welding set provided the current; and the arc voltage was about 20 volts. Conditions were the same on all welds, observation being that greater speed was obtainable on the ¼-inch welds than on the larger fillets. With the exact unit stress for design purposes definitely established, it is now possible to design structures of all kinds and sizes without further concern regarding strength, uniformity and reliability.

WESTINGHOUSE ANNOUNCES COMPLETE LINE OF WELDING GENERATORS

In rounding out its line of welding equipment the Westinghouse Electric and Manufacturing Company has recently brought out new three hundred and four hundred ampere single operator arc welding generators of the belted and coupled type which may be used where driving power such as motors, gasoline engines, tractors, lineshafting, etc., are already available. Speeds of 1750 and 1450 rpm. clockwise and counter-clockwise rotation provide ratings for every application.

The complete unit includes a generator, direct connected exciter, control panel, and reactor. The generators have small overall dimensions to permit mounting where space is a premium.

The control for the unit is mounted on top of the generator frame and is enclosed by a sheet metal cabinet. The control includes a voltmeter, ammeter, and single dial field rheostat for adjusting the welding current over the entire range. The welding current range of the 300 ampere unit is 90 to 375 amperes while that of the 400 ampere unit is 120 to 500 amperes.

The welding generators are all special type SK, single operator, constant current, differentially compound wound, separately excited generators. Due to the separate excitation feature, variations of arc length or intensity are automatically compensated for by instantaneous changes of generator voltage, resulting in simplicity of control and efficient operation.

These welding generators are all rated in accordance with the recently revised N. E. M. A. Standards, 1 hour, 50 deg. C. Temperature rise on a resistance load at 25 volts.

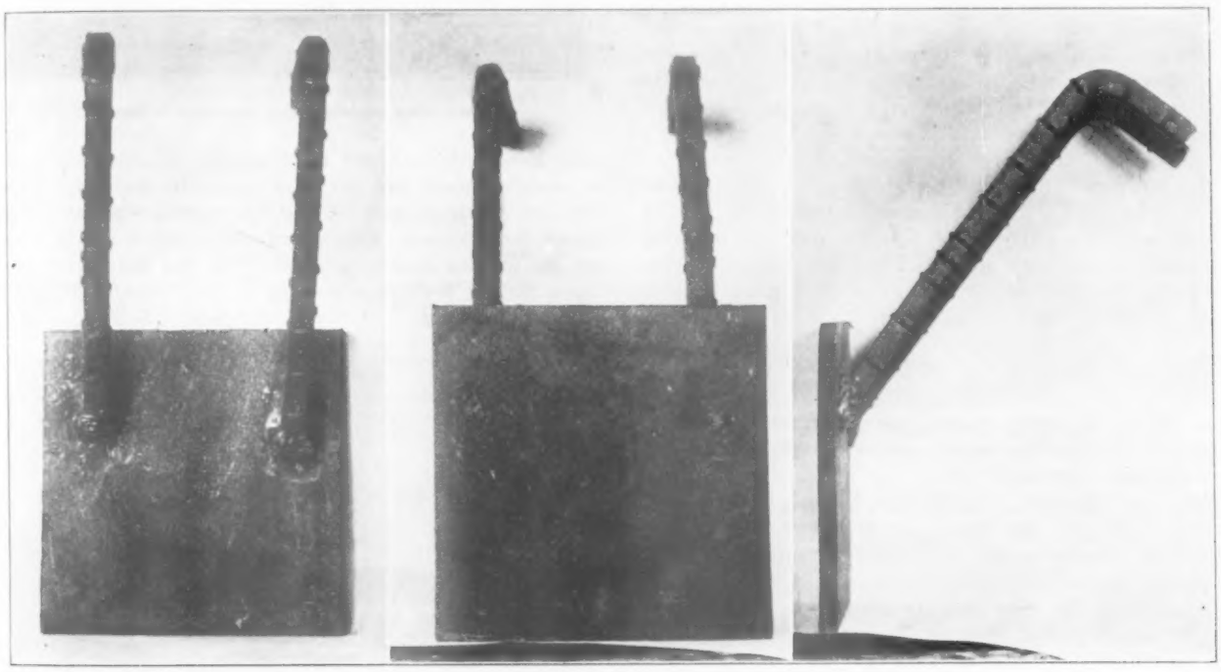
The units are of the single operator type, but multiple operator generators can be furnished in standard 500, 750 and 1000 ampere ratings. Larger ratings are available by referring to the main works at East Pittsburgh, Pa.

Stronger and Simpler Lintel Design

Simple Face Plate Made of Plate Steel and Reinforcing Rod Replaces an Awkward Bolted Assembly

A UNIQUE and new design in building construction in which electric welding was used in a very novel and useful manner, was recently incorporated in the erection of a large retail store in San Francisco. This building, which was built for the Sears, Roebuck Co., was 200 feet square and three stories high, with a tower above the main entrance and also a tower at the rear, covering the elevator shafts, machinery, etc. Quoting one writer, who says, "This structure is purely modern in spirit and design," it may be added that this includes some very interesting construction detail, since among the modern ideas incorporated in this building was a floating mattress foundation which was desired to prevent uneven settling of the building. Again, the modern thought was evidenced in a reinforced concrete structure, which was entirely faced with decorative brick, resulting in a very beautiful building, as well as a strong one. Since the brick is only of one width around the entire building, it was necessary that there be tie-ins or supports for the brick, which support of necessity, had to withstand the total weight of the brick above doors and windows. An engineer from the Welding Engineering Co. of San Francisco was called to the building site immediately after the concrete pouring tower was installed, to estimate some repairs to the tower, and in a subsequent conversation with the superintendent of the building, the prints covering these supports for the brick (which were technically termed angle "lintels") and their application mechanically, were shown to him. The difficulty of applying these angle lintels mechanically can be readily understood, since it meant that plates had to be embedded in the concrete for the fastening of the angle lintels. Considerable work was involved; that is, drilling the plates and counter sinking for bolts which were to be imbedded in the concrete. Then after the plates were in position, each plate had to be drilled and tapped and then the angle laid out and drilled to conform to the holes in the plates, and then fastened by means of studs. This was obviously so cumbersome and expensive that a strong effort was made to convince the construction engineers that welding was the proper and modern method not only of manufacturing the inserts, but also of fastening the angle lintels.

In spite of the work involved in the process called for in the original design of the lintels, it was a difficult task to convince the construction engineers of the contracting company and the Sears, Roebuck Co. that welding would be a very simple solution and the ideal method of doing this work. Samples were therefore made up to demonstrate a limited support of welded design. Both the inserts and then inserts with angles welded to them were demonstrated. Then thorough tests were made by the construction engineers, to determine the strength of such an installation and the ability of the welds to hold the weight which was placed upon the angles. The effect of the heat on the inserts was feared, since they were imbedded in green concrete and the welding engineers had to guarantee that there would be no detrimental effect, and that welding the angles to the plate inserts would not loosen the plates in the concrete or cause cracks around them. Objections were finally overcome and the inserts, as shown in Figure 1 were accepted. These were embedded in the concrete so that the face was flush with the outside wall of the building and were placed on 2-foot centers. In the manufacture of these inserts reinforcing steel was welded to the back of the plate and hooked as shown, so as to be thoroughly imbedded in a secure manner in the concrete. There were three lines of these inserts around the building, and also, at regular intervals around the tower and elevator house.

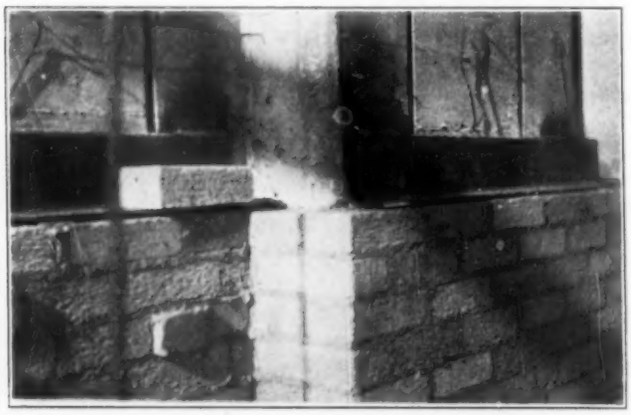


Back Front and Side Views of Plates to Which Angle Lintels Are Welded.

The angle lintel welded in place is shown in Figure 2. When the first weld was made of the angle to the insert, all officials concerned in the erection of the building, were present as they were not convinced that it would be possible to make this weld without destroying the concrete around the plate. They were agreeably surprised at the small amount of heat remaining in the insert and angle after the weld was made, and expressed them-

selves as satisfied that the job was going to be a success.

A 200-ampere USL Electric Welder was used and on the top floors it was necessary to use about 400 feet of cable. One welder handled the job, and in spite of the fact that there were



View of Angle Lintels in Wall Welded to Plates.

60 bricklayers on the building he managed to keep ahead of them. The superintendent of the building at various times commented on the speed and efficiency, with which the work was done and, as a final tribute, stated that, "This has been one of the most pleasant sub-contracts we have ever had. You have not delayed our men a moment's time throughout the entire building. Electric welding certainly is a great thing."

This progressive welding contractor has won the respect of building contractors by applying the "redesign" idea in a place eminently suited to it. The fundamental advantage of welding is the elimination of an awkward mechanical connection involving countersunk bolts, substituting the simpler procedure of welding on both sides. There would have been little advantage in welding if the old design had been followed.

MOVIE DEPICTS ARC WELDED PIPE LINE CONSTRUCTION

A new educational motion picture portraying the construction of arc welded pipe lines has recently been released by The Lincoln Electric Company, Cleveland, Ohio.

Entitled, "Arc Welding, The Modern Method of Pipe Line Construction," the new film tells a graphic story of how pipe lines are built. Beginning with the arrival of the pipe from the manufacturers, the motion picture shows each successive step in the construction of pipe lines until completion.

In order that the movie illustrate the latest and most modern pipe line construction methods, operations on the major arc welded pipe lines now under construction were photographed.

The motion picture is contained in two reels of 16 mm. film, making it possible to be shown in offices as well as in auditoriums to large or small audiences. The film is offered gratis for showing upon application to The Lincoln Electric Company, Cleveland, Ohio.

ANOTHER ARC WELDED PIPE LINE BUILT

A large scale application of arc welding to pipe line construction is demonstrated in the construction of the new El Paso Gas Line from Jal, N. M., to El Paso, Texas.

The character of the country, practically all desert and abounding in sandstorms, has given the methods and material employed a severe test—but progress has been successfully maintained from the start.

The line is being constructed entirely by welding employing the metallic arc. The pipe itself is also fabricated by this method in the plant of the A. O. Smith Corporation in Milwaukee and the line also employs their recently announced welded expansion joints.

In construction the 30 foot lengths of pipe are first joined into sections of 5 to 8 lengths, usually 7, by tack welding and are then welded by "the firing line welders," the pipe being turned by tongs as the welding operation progresses. "Firing Line" welders are averaging 13 completed welds per ten hours. The sections are then joined "by the Bell Hole Method," in which a hole is dug for the welder, and he works completely around the pipe as it rests stationary over the ditch.

General Electric, Lincoln and Fuzon Welders are on the line. This latter machine is a mobile outfit, being mounted on pneu-

Bell Hole Welding with Portable Welder.

matic tires, with standard Ford wheels. It can be hauled at automobile speeds and has been especially popular with the "bell hole" welders, according to the welding superintendent in charge, both because of the speed with which it can be moved, and the welding results obtained. The rod being used is the Green Surface Weldite, a product of the Fusion Welding Corporation of Chicago.

Transporting the Welder over the Texas Desert.

The value of protective coating which surrounds the arc with a stable atmosphere has been strikingly illustrated by the recent testing of a number of welds that were made during a severe sandstorm with uniformly good results.

The construction method was carefully laid out in advance, the operations split up, and the crews organized in much the same manner as modern factory production is organized.

Inspection is handled by a firm of engineers employed by the finance company. The inspectors took into the field two portable milling machines and a tensile testing machine. The welds were subjected to particularly severe testing in the early stages of construction with especial reference to the selection of the rod to be used and they continually tested both pipe and welding equipment as the line was being laid.

Gas Welding in Model Production*

An Inexpensive Way to Make Preliminary Models of Exact Size and Shape of Articles to Be Manufactured

By J. L. Andersen†

WHEN one looks at a beautifully shaped metal cabinet decorated in one of the modern art finishes, genius is recognized but seldom is the story told of its development for mass production, or the steps towards its present splendor traced.

The development of such products often dates back to very insignificant beginnings and it is to the beginning of such creations that your attention is directed.

In the production of elaborate or even simple sheet metal products that are expected to have a very great sale, but which must be made of pleasing appearance and at the same time meet perfectly the mechanical or other requirements for which they are designed, it is customary to build hand-made models of various dimensions and details of ornamentation until the design or construction is developed which is most generally acceptable. This course is pursued because the finished product there can be viewed from many angles, decorated to harmonize with design, compared with other models, tested for performance if the case is a component part of a device, insures speedy production and economy through the elimination of expensive dies and tools which could not be easily modified and which require long periods for manufacture. It is in such instances that the oxy-acetylene welding torch proves its worth even though the final product when in mass production does not in any way lend itself to gas welding. An interesting example of the value of the oxy-acetylene process was recently afforded in the development of metal cabinets for one of the popular radio sets now manufactured at the rate of several thousand per day. Needless to say the beautifully modeled cabinet now so familiar to everyone is not the first design that was developed; in fact, it has little resemblance, but withal, the first cabinet was a delight to the eye with its nicely rounded corners and raised panels.

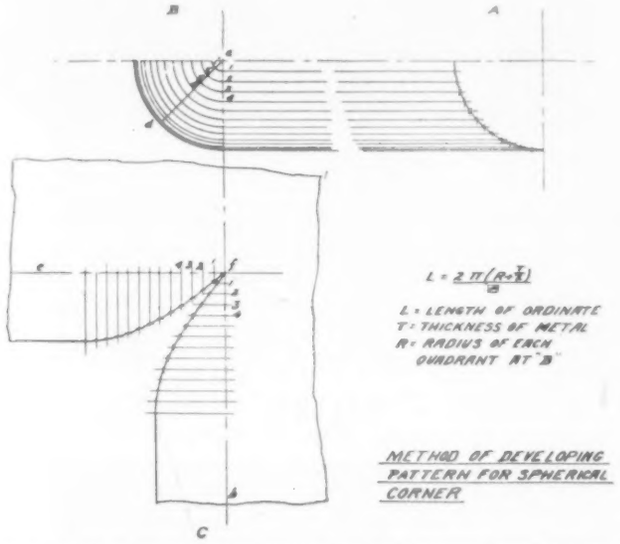

B
A
C
L = 2 π (R + T/2) / 8
L = LENGTH OF ORDINATE
T = THICKNESS OF METAL
R = RADIUS OF EACH QUADRANT AT "B"
METHOD OF DEVELOPING PATTERN FOR SPHERICAL CORNER

Fig. 1. Steps in Developing a Pattern for a 90 Degree Rounded Corner.

It was in the development of this first model that the proportions of the curves with reference to the other lines was studied and modifications planned.

Various modified models were constructed and models of component parts made for comparison until the design in which every curve and line seemed to fit right into the picture without discord, was evolved. At this point complete duplicates were made so that the various art finishes could be applied and comparisons made until the final stamp of approval was given with the hope that the public would respond—with an overwhelming demand for the product.

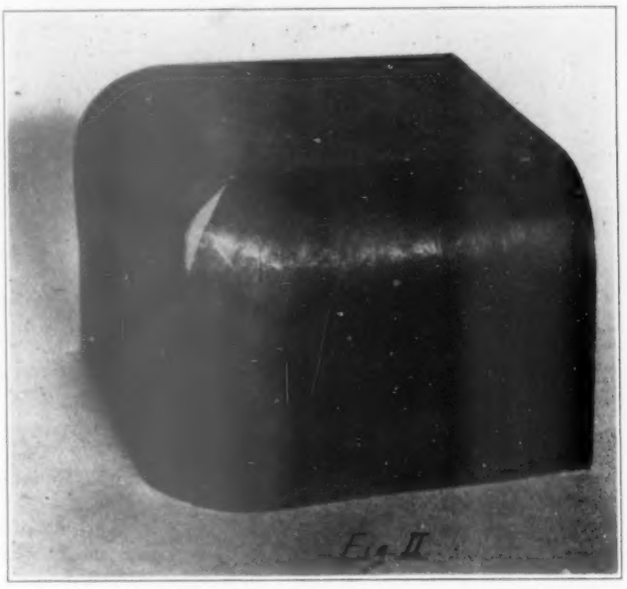


Fig. 2. The Open Edges Shown Will Come Together When Dressed to Shape with a Mallet.

The production of a finely shaped cabinet by hand from flat sheets of annealed cold rolled steel at first glance appears difficult, but in reality can be quickly and easily carried out if care is exercised in the laying out and the principles of sheet metal fabrication are clearly understood.

The production of simple curves and offsets offers no particularly difficult problem because these shapes are easily formed in the hand-operated brakes which are a part of the tool equipment of most sheet metal working departments.

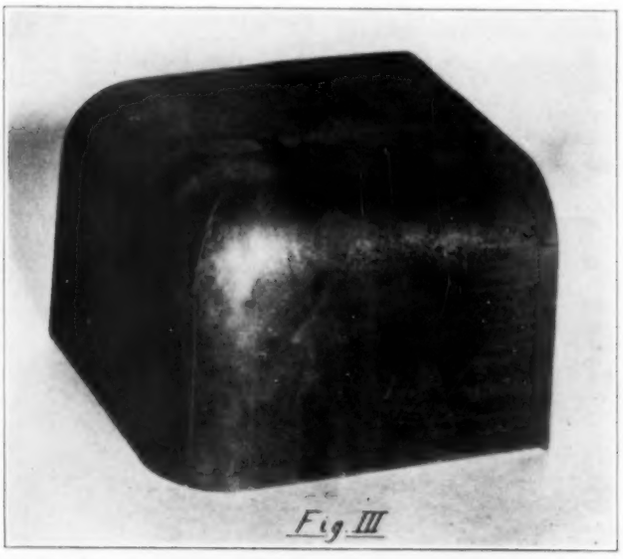
The production of rounded corners where curves meet from three directions is another matter when these accurately finished surfaces must be produced by hand with press and die accuracy.

It is here that the acetylene torch comes to the aid of the metal worker and the following procedure is carried out. Assuming that the design shown in Fig. 1 at **A** is the profile of the meeting curves and the angle of approach of the curved edges is ninety degrees in each case, the first step

*From the International Acetylene Association Forum.

†Research Engineering Department, Air Reduction Sales Co., New York City.

in the development of the pattern is shown at **A.** A quadrant having the same radius as the rounded edges is drawn. The arc of this quadrant is in this case divided into thirteen equal parts. Each dividing point is projected horizontally to **B** where it intersects the vertical line **a-b.** From **a** as a center and with radii equal to **a-1, a-2, a-3,** etc., draw thirteen quadrants and bisect these quadrants with the line **a-d** at 45 degrees to **a-b** representing the corner seam. Along the vertical and horizontal lines **e-f** and **f-b** lay off thirteen parts equal



After Dressing and Heating Only a Simple Seam Remains to Be Welded.

in length to the subdivisions of the quadrant **A** and erect ordinates at each dividing point equal to the corresponding lengths **1-1', 2-2', 3-3',** etc., taken from **B.** The curves described by the ends of these ordinates form the profile of the pattern to which the sheet is to be sheared for the formation of each corner.

Each ordinate can be computed by the formula indicated in Fig. 1, or if for the sake of rapidity approximate dimensions only are satisfactory the lengths can be determined by stepping off the ordinates with dividers. Any inaccuracy in this case will be a minus quantity and the metal added fn welding operation will supply the deficiency.

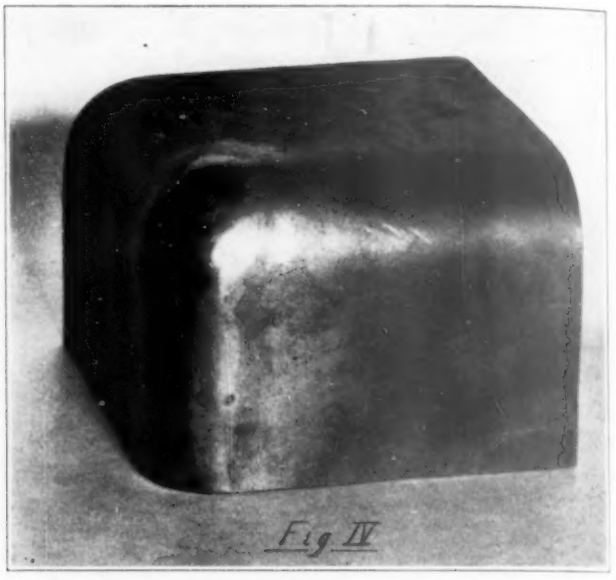
When formed the corners will produce the appearance shown in Fig. 2 and a gap in the edges will be noticed. It will also be seen that there is some excess metal not in the proper position to give the required shape.

No attention is paid to this gap until the meeting edges of the perpendicular cuved corner are welded and dressed down to the desired contour.

Now with a stake finished to ball shape on the end and of the exact inside dimensions in accordance with the radius indicated in Fig. 1 the corner is placed on the end of the stake and with a mallet is dressed to the exact shape. If the radius of the corner is considerable the metal can be dressed to the proper curvature more readily by heating with the torch, but for the small radii the heating can be omitted. It will be found that the edges which were open are now closed and only a simple seam weld remains to complete the corner which when dressed to correspond with the balance of the job will show no evidence that it was not made in a press.

The method just described for round corner model production is the most simple, but many sheet metal workers not familiar with the oxy-acetylene process resort to the fitting in of one-fourth sections of discs spun to the proper curvature usually soldering or welding the meeting edges.

The forming of the corners produces the foundation upon which embellishments in the form of curved or other shaped beading may be applied; or, if it is desired, the embellishments can be formed in the metal itself by laying out and



Corner After Welding and Grinding Presents a Pleasing Appearance with No Evidence of a Joint.

bending in brakes. The latter method gives the exact dimensions to which the blanks must be developed for future production by press work. Raised or depressed panels of any shape can be worked into the design of the sides or top either by brake forming in the case of rectangular forms or with the assistance of a raising hammer if circular or curved in form.

The production of raised panels will usually be made more simple if the welding torch is employed where excessive stretching of the metal would otherwise be necessary.

The welding process applied in this type of experimental production affords the opportunity to duplicate with extreme accuracy the best press work and permits models to be finished by baking or other heat treatment exactly as the final product is finished and at one stroke the development of the model is complete.

WESTERN NEW YORK SECTION ELECTS OFFICERS

The Western New York Section of the American Welding Society held their annual election meeting on April 30th, 1929. The membership of this section comes from the Buffalo and Rochester district and is composed of representatives from a great variety of manufacturing concerns found in that locality. The following officers were elected and chairmen of the different committees appointed: Chairman of the Section, Mr. J. Norman Wilson of the M. M. Donner Steel Co., Buffalo, N. Y.; Vice-Chairman, Mr. Thomas S. Gaylord of the Eastman Kodak Co., Rochester, N. Y.; Secretary and Treasurer, Gideon W. Swan of the John A. Roebling's Sons Co., Buffalo, N. Y.; Representative to the Parent Association, Mr. F. L. Rodgers of the Linde Air Products Co., Buffalo, N. Y. The members of the Executive Committee are: Thomas S. Gaylord, Robert Siemer, Gideon W. Swan, C. H. Lockwood, R. W. Bannar, Edward S. Hebeler, and J. Norman Wilson. The Chairman of the Papers and meetings Committee is R. W. Bannar of Root-Neal & Co., 178 Main St., Buffalo, N. Y. The Chairman of the Membership Committee is Mr. Robert Siemer, President of the Allan Manufacturing and Welding Co., 726 Washington St., Buffalo, N. Y.

Arc Welding for Alterations

When This Job Was Estimated Both Ways The Figures Were in Favor of Welding and Costs Were Very Close to Estimate

By F. H. Marsh*

An unusual and strikingly economical application of arc welding to structural steel which we recently completed is an alteration job for the Standard Furnace & Supply Co. of Omaha. This work consists of going into an old building four stories high, cutting holes through the existing floors, installing a row of beams, at each floor level and roof, down the center of the building, supported by steel columns. The building is about 120 feet long.

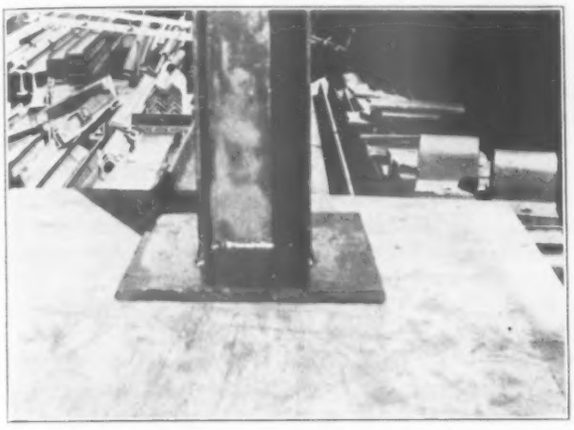


Fig. 1. A Base Welded on a Column Shaft.

Because of the great variation in the floors and the roof, it was impractical to go into the building and take measurements to establish the elevation of shelf angles on the columns for the support of the beams.

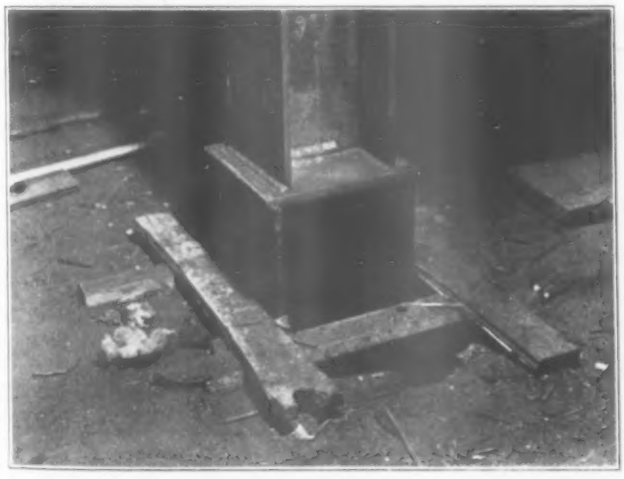


Fig. 2. Showing Splicing Where Two Different Size Columns Join.

This was a real all-welded job, for we used no bolts or rivets in any place in the construction of this work. The column shafts were sent to the building with bases and splice plates welded on; the beams were sent to the building cut to length only. We then supported the beams on timbers, which in turn were carried on jacks at the lower end. The beams were jacked to their proper elevation and welded all around, top, bottom and web, to the flanges of the columns.

Fig. 3. Floor Beams Welded to Column.

Details are clearly shown in the sketches and photographs. The small photo was taken at our shop and shows the base welded on the column shaft. One of the larger photos shows the splice above the floor where a column smaller than the one below was welded to the cap plate of the lower column. Where two column sections of equal size occur above each other we simply set one on top of the other and butt welded the entire cross section. One of the large prints shows beams completely welded to the column

Fig. 4. Welding Beam Connections to Column.

*Paxton & Vierling Iron Works, Omaha, Neb.

(Note: Paxton & Vierling Iron Works are among the very first fabricators to promote structural steel welding. They have followed developments in structural welding closely and have a number of good jobs already to their credit. Among these is the steel frame for a hay barn described on page 38 of our April issue.—Editor.)

shaft. To the left will be seen the supporting timber under the beam. The other large drawing shows the operator at work welding a beam connection to the column.

In bidding for this work we estimated the job two ways, one on the basis of a field bolted standard job and the other on the basis of the field welded construction as shown. The job is only a small one, having about 28 tons of steel, but our bid on the field welded job was $120.00 less than our bid on a field bolted job. We have completed our cost records and find that our erection checked within less than 2 per cent of the estimated cost, including the field welding.

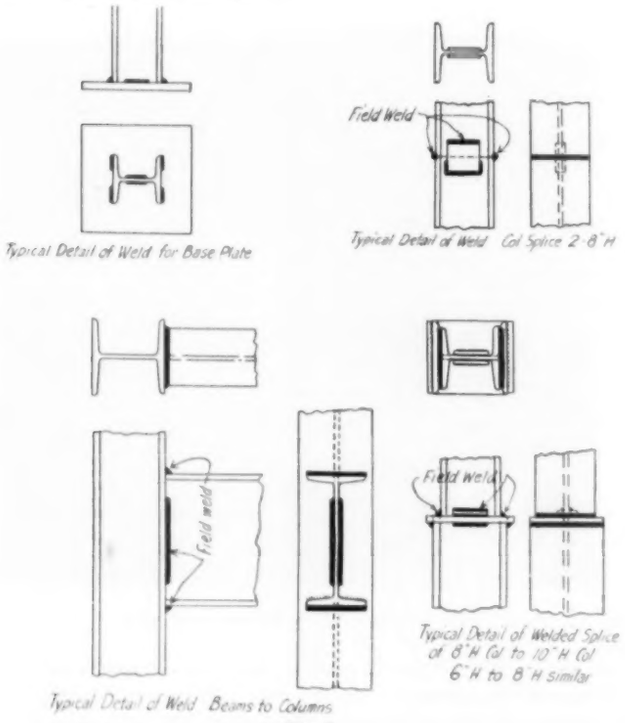

Typical Detail of Weld for Base Plate
Field Weld
Typical Detail of Weld Col Splice 2-8"H
Field weld
Typical Detail of Weld Beams to Columns
Field Weld
Typical Detail of Welded Splice of 8"H Col to 10"H Col 6"H to 8"H similar

Fig. 5

All the welding in the shop was done with a General Electric 300-ampere machine. For the field welding we took this machine and a Westinghouse 200-ampere machine to the job, doing all the field welding with these two machines.

In order to be absolutely positive that this work continues to be satisfactory we expect to send one of our inspectors to this building at least once a month for the next year and go over each and every weld carefully, inspecting same for cracks or any tendency to pull away.

THE BIG WELDING EVENT OF 1929

National Metal Congress and National Metal Exposition

AMERICA'S first annual Metals Congress, an assemblage of the leaders in the metals industries and those who will be the leaders is to be held in Cleveland, Ohio, September 9 to 13.

Here will be met for the first time the men who are responsible for the progress of this country in production, treatment, fabrication and use of the various metals, ferrous and non-ferrous.

Here, too, will be made reports on progress made during the year in the field of research and interesting and highly valuable papers will be read at the various sessions.

This National Metals Congress is, to a considerable extent, an outgrowth of the great conventions and expositions held by the American Society for Steel Treating with whom several other organizations have joined in late years.

It opens in Cleveland simultaneously with the eleventh annual convention and exposition of this society and in the home city of the society's present president, Dr. Zay Jeffries, and its secretary, W. H. Eisenman.

Coincidental will be the national fall meeting of the American Welding Society, the national fall meeting of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, the national fall meeting of the Iron and Steel Division of the American Society of Mechanical Engineers and the national fall meeting of the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers.

The tentative outline made for this coming session of experts in metals is such as to indicate that this will be the foremost of gatherings of those allied with the metal industries and will mark the inauguration of a National Metals Congress which will grow in significance. Such a congress of authorities will be of inestimable value to those interested in the progress of metals.

When men of metals get together they have in mind progress in every scope of metals and as metals effect every industry, every enterprise and every home, this first annual Metal Congress takes on additional importance.

In addition to the metals congress there will be assembled in Cleveland's big public auditorium the eleventh annual metal exposition in which will be displayed the most modern types of machinery and equipment used by metal using concerns of the country. Demonstrations of the various devices aimed to improve conditions in the processing of metals will be of inestimable value.

W. H. Eisenman, secretary of the American Society for Steel Treating, who also is manager of the exposition, has reported that present facilities at Cleveland for the exposition are such to permit one of the greatest metal expositions that he has yet arranged. He also has indicated that the expositions will have on display a great number of new ideas in metal processes which have been developed in the past year and to which every person interested in metals will want to give much time.

Floor plans for exhibit space have been ready for some time and already over 200 exhibitors have subscribed for display space. Eisenman has been advised from many sources by men in the various industries that the calling of this First National Metal Congress is one of the greatest forward steps taken in many years in the interest of men following all lines of development in metals.

The sessions of the five societies which convene at this time have always brought together leaders in the steel and iron fields. This year they will assemble many from other branches of the industry. The combination is one much to be desired and the results of such meetings will be of untold value.

The complete outline of the programs at these sessions is being prepared but previous meetings of these groups have been sufficient to assure attendants that the 1929 congress with its augmented program will be the most important yet held.

Leaders in the industries as well as representatives of the different chapters of the various societies will be on hand and Cleveland, for the time being, will be the metal capital of the world. It will be the fount of additional knowledge and it will be the scene of a most comprehensive metals exposition.

Secretary Eisenman, with the convention and exposition nearly three months ahead of him, already is handling a great amount of detail in preparation for it. He has added to his quarters and to his staff so that every detail might be worked out for these visitors.

The City of Cleveland is paying special attention to this event and is lending its co-operation to Eisenman in his preparations as the community realizes and appreciates that this is to be the greatest metals event ever held in America and perhaps the world.

Ample accommodations will be worked out for these contemplating attending these sessions and exposition. The city of Cleveland will be turned over for this period to the men of metals.

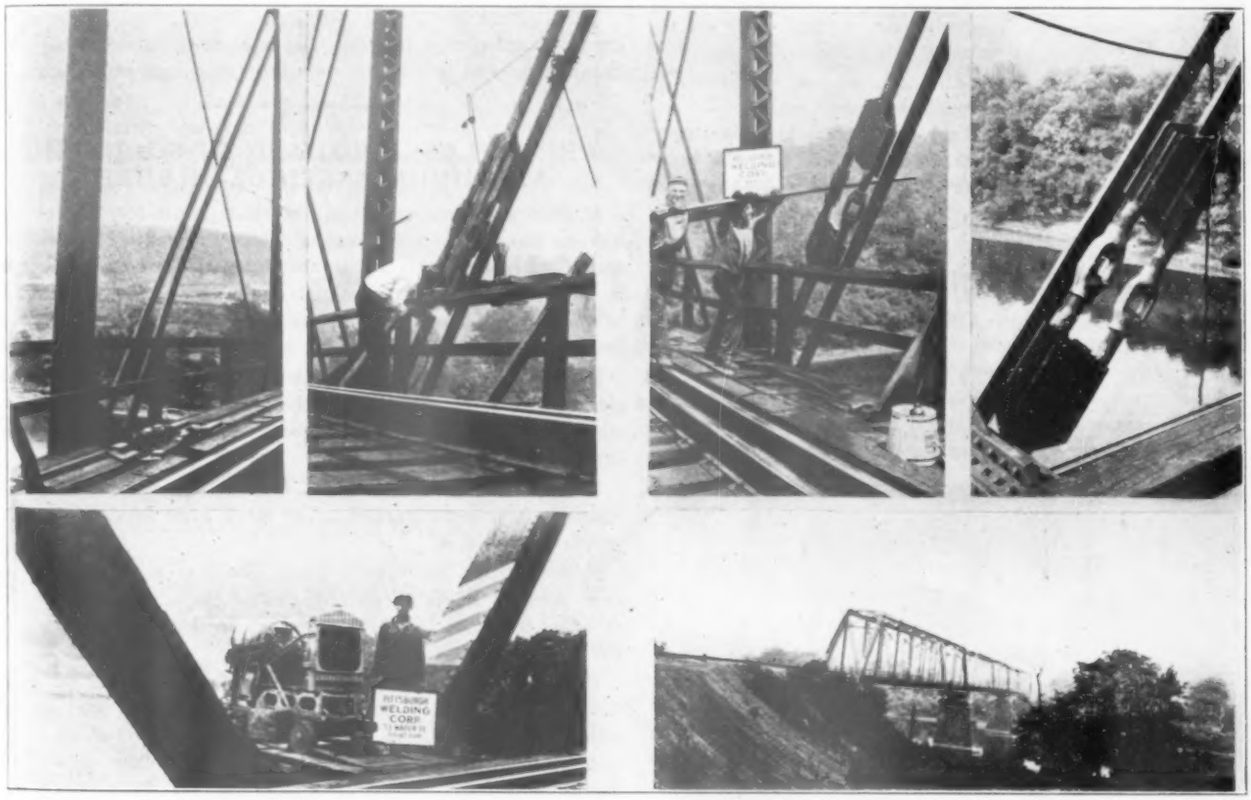
The secretary is thus early asking all interested to make immediate plans for this event and has been given authority by the city to send broadside invitations to all metals men to attend. The American Society for Steel Treating, through Secretary Eisenman, also is broadsiding an invitation and the society is confident that this initial move toward a National Metal Congress will be a great success.

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

REPAIR WELDING A THREE SPAN RAILROAD BRIDGE

The photographs shown below illustrate an unusual welding repair job recently completed on a large railroad bridge. This bridge located near Pittsburgh, Pennsylvania, over the Kiskiminetas River is a pin and link type, through-truss structure of three spans. The principle repairs were necessitated at points where some of the eyebar diagonals in each of the spans had become elongated by wear and vibration. In order



The Four Upper Views Illustrate the Steps in Welding the Turnbuckles to the Eyebar Diagonals. The Lower Left Shows Apparatus Used. The Lower Right Shows View of Entire Bridge.

to remedy that situation it was decided to insert a tightening device in the inactive members.

This device, as is seen in the upper photographs, consisted of two turnbuckles welded to plates. These plates in turn were welded to the inactive bar, and with this assembly complete the bars were drawn up tight and adjusted. After the welding operation was completed, it was tested by drawing up each turnbuckle with a 15 foot lever and subjecting the welds to heavy blows of a sledge. The welding equipment used consisted of a General Electric gas engine-driven welding set. The work was done by the Pittsburgh Welding Corporation.

WELDING IS "THE FIXER"

By D. D. DeTrow

Four o'clock and time to go home. A very dull day and not work of any kind to do all day. As I walk to the wash room I hear a long sharp squeal as Number Two Turbine is taken off the line and the condenser vacuum line opened. I wash and change to street clothes and am ready to go to the office to make out my time card. There is a sudden, loud crash, then the blast of the emergency horn and this spells trouble for some one. Trouble at the Acme Power plant usually means work for the welder. Welding has long past the experimental stage at Acme and is the Fixer. This time is no exception and I am called to change back to overalls and goggles and view the wreck.

What a wreck! A small safety valve on the exhaust side of a steam condensate pump failed to function and the cast iron side of the pump failed to stand the leakage. The casting was in 11 pieces and no extras to be had. This was the first time such an accident had happened in the memory of the officials. The pieces are carefully gathered and champfered and fitted into place. A smooth planer bed is used for a

lining surfaces and is carefully covered with two thick sheets of asbestos paper such as should be in the shop of very welder. There is no charcoal but plenty of city gas so a gas torch is improvised to fit inside the casting to furnish EVEN heat and proper expansion. At 7 o'clock the casting is fitted, tacked, bolted and preheated and welding started. At 12 o'clock the job is done and now for the cooling as fast as we dare and still hope to keep a soft ductile cast iron that can be machined. I had a 35-1000th part of an inch allowance for warp and any more meant scrap. At 3 o'clock the casting was ready to machine. Careful checking revealed that the warp had been less then 19-1000th part of an inch. At 6 o'clock the pump was again ready to function and we still had until 7 o'clock to start the Turbine.

At 7:30 the foreman is on the job and after inspecting the weld says "Good job Doc! Here's an order for your breakfast at the restaurant. Take your time about getting back for you will have another good job at Maumee hydro plant. Philip just called up and said one of the water gate gear lifts had stripped three teeth."

So it goes with welding here. "Save the pieces. Tell the welder what they are to look like and they will be FIXED."

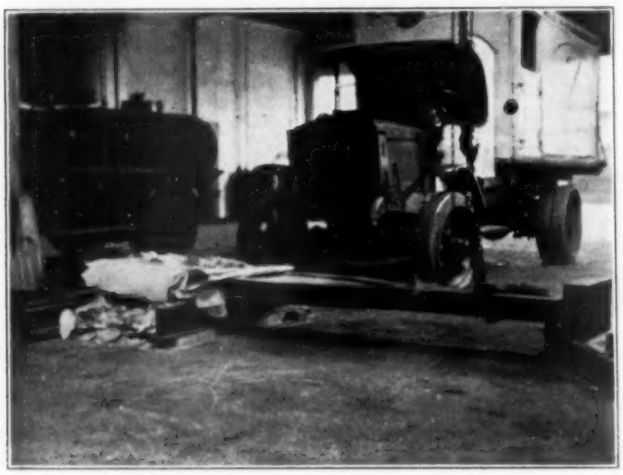
Welding has lost all the glamor and mystery after 8 years.

We have just finished the assembly of a new 40,000-Watt Turbine and we did all our own fitting and installation work other than the building and concrete work. Pipes were welded in sizes from ½ inch up to 48 inch. All oil lines were welded or brazed, and where flanges failed to face, the pipe was promptly cut and welded with the flange brought to perfect face.

Pressures varied from return lines at 1 pound to main steam headers at 250 pounds per square inch. There has not been a weld failure on pressure work in this plant since the first experienced welder was hired.

WHEN THE BENDING BRAKE BROKE

In spite of every precaution, machinery has a most distressing habit of breaking at most inopportune moments. The resulting loss can be little or great, depending on several factors. If the part which breaks is small, replacement can usually be quickly effected from replacement parts carried in stock. If the break is a major one, in a large casting, for instance, then the situation is



Casting From Bending Brake in the Preheating Furnace.

serious. If, furthermore, the damage happens to a key machine in the production line, a delay might follow which could completely disrupt the entire organization if replacement were the only way out. Large castings are not always carried in stock by the manufacturer and consequently a new casting may have to be made. From the time replacement order is given until the casting is back in place again is always a matter of several days, and more frequently several weeks. This is especially true if the factory happens to be situated at some distant or isolated shipping point.

With the adoption of the oxy-acetylene process for maintenance and repair, many factories have considerably lessened the losses incurred by major breakdowns. These repairs are now effected without replacement. The repair is accomplished by either bronze welding with a high strength bronze rod or cast iron welding with a special cast iron alloy rod. Under the first method no preheating is necessary and the parts are welded in place without dismantling any part of the machine.

The accompanying illustration shows a heavy casting has been repaired by the second, or preheating method. This casting, the main portion of a bending brake, weighing about three tons, fractured clear across the top. This brake was built to bend plate up to ⅜ inch and due to accidental overload it rebelled with the result shown. A contract welder called by the manufacturer took the bulky casting to his own shop for convenient repair.

After lining up the casting by supporting it between two I-beams, a temporary preheating furnace was built around the break. A gasoline preheating torch was first employed, and after a few hours of steady flame aplication, charcoal was substituted, and the heat confined by a liberal use of large asbestos sheets. Two welders alternated in the actual welding operation. Actual welding was completed in about two and one-half hours. The casting was then allowed to cool very gradually in the dying fire.

The cost of this repair was quite trivial when compared to complete replacement figures. The total delay in factory production was reduced to a matter of a little over forty-eight hours.

PRINCIPLES INVOLVED IN SOLDERING ALUMINUM CASTINGS OR SHEETS

A good aluminum solder will work at about 350 degrees and will be harder than the casting when cold. It will "tin" on easily and be free from all impurities, bonding perfectly. It must be kept well wrapped; absolutely clean and free from grease, acid and alkali solutions, and must not be handled with greasy hands.

If the solder has been made from virgin metals properly cleaned, and is carried through the correct temperature range in melting and casting, it will not be materially affected by age if kept clean and dry.

But, however good it may be, it will not make a good job unless it is properly applied. The work must be carefully prepared to receive it.

Assuming that we have a 3-inch crack in a crank case—the first thing to do is to entirely cleanse the metal with gasoline in order to remove all grease and oil so that the full extent of the break can be ascertained.

It is then necessary to cut a V-shaped groove along the crack so that the angles of the V are about 45 degrees and smooth, using a thin, sharp cold chisel ground like a wood chisel.

After this groove has been cut, the metal on both sides of the top of the groove should be ground off for about one to one and one-half inches back from the edge of the V. This grinding or scraping will remove the outer coating of aluminum oxide and rough porous metal, and leave exposed a bright, clean and smooth surface of aluminum.

Oxygen from the air combines with aluminum, forming aluminum oxide, a colorless coating over the entire surface. Scrape or file it off, and immediately it begins forming again. Nothing will adhere to aluminum over this coating of oxide.

To properly tin an aluminum casting or sheet with aluminum solder, scrape, file or grind off the surface to be coated until it is clean and smooth. Heat with the torch until hot enough to melt the solder freely, then coat the entire surface by rubbing the solder lightly over the surface, leaving a liquid coating behind.

Now, apply heat directly to this coated surface to keep it in

a thoroughly liquid condition, and at the same time take a clean wire or brass brush and brush the coated surface vigorously, playing the torch over the solder coated surface all the while to keep it from cooling.

This brushes the newly formed oxide off the aluminum and, at the same time, works the molten solder into the pores of the metal without allowing air to come in contact with the aluminum again. This gives a perfectly tinned surface and a good bond.

Now a smaller flame may be used. Heat up the tinned surface and apply solder directly in the flame if desired, melting down enough to fill the groove and reinforce the work. Solder should be hot enough to be plastic and waxy, but not hot enough to flow.

Use a putty knife or some similar instrument to work and knead this plastic mass like kneading dough. This works it into a solid, tough and dense condition.

Fill in the groove: work it well down the sides and to the bottom, forcing it entirely through, packing it solid and overlapping the shoulder of the V to reinforce the work for additional strength. Allow the work to cool in the air.

The solder will be very brittle for the first two or three minutes. It takes some little time for it to solidify. If the casting has been heated more than necessary and has been caused to expand it may cool off a bit before the solder has time to solidify and thus cause a small crack to open in the soldered seam that could have been avoided by allowing the casting to cool a bit before filling in the break; or, if it occurs, turn the flame down lower and after the job has cooled off, melt down the solder along the crack and with the putty knife work it into a solid mass again and the job will be all right.

For sweating joints, tin both surfaces to be joined in the manner described above, puddling on a little excess solder on one surface to make good contact, laying the other piece over this solder. Heat until fusion has taken place and clamp together until cool.

After two sheets have been tinned they may be soldered together with common solder. A sheet of aluminum that has been tinned with aluminum solder can be soldered to any other metal by using common solder. The other metal will require a flux, but the newly tinned surface of aluminum will require none.

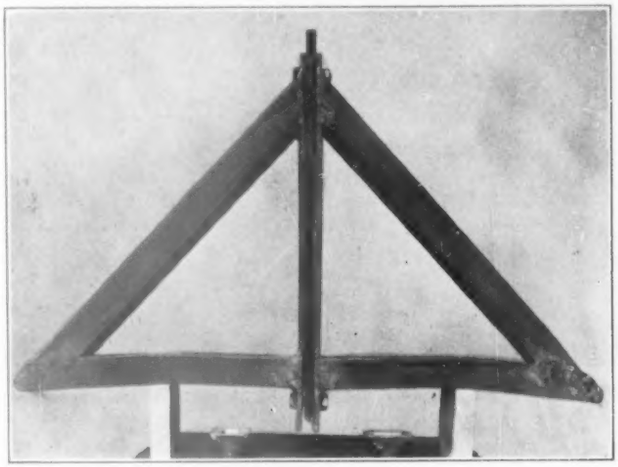
SERVICEABLE PIPE BRACKET

A manufacturer in the power piping field is turning out a sturdy pipe bracket of oxwelded construction. His reasons for supplanting the familiar cast iron pipe bracket with one of welded steel construction are interesting. The steel bracket will never fail under stresses caused by vibration, expansion and contraction of the pipe. This type is lighter and consequently easier to install. It can be made in less time, and at less cost than a cast iron bracket, and there are no production losses.

Plant managers will be interested in knowing something about the design of these brackets and of a test to which they were subjected to determine dependability. They are made in the shape of a 45-deg. triangle, to be used bolted to a wall or post. Each bracket is made from a piece of flat steel plate and two steel angles. A 135-deg. notch is made with the cutting blowpipe the full width of the wider leg at each angle. Next, the angles are heated at the location of these cuts, bent to 45-deg. and the joined edges of the notch welded. Now the lower ends are mitered so that they will fit flush against the wall plate. The angles are welded to the wall plate with one inch clearance between, and connected at the bend by a little stiffening plate welded to them. When the brackets are in use an adjustable pipe stand rests on the horizontal member and is held in place by projecting lugs extending downward between the angles.

These brackets, which are made of a plate 30x½x4-in. and two angles 2½x1½x¼ in., were subjected to the following test: They were bolted together back to back to make an arrangement which could be placed conveniently in a compression machine. The average load per bracket for two tests to produce permanent deformation was 14,750 lb. Although severe distortion took place, the weld held perfectly, as shown in the accompanying illustration.

The results of the tests convinced this manufacturer that



A Welded Pipe Bracket.

welded steel would give him an improved product and a dependability which the other type of bracket lacked.

WELDING MONEL METAL

Success in welding Monel metal requires a knowledge of the properties of this alloy and of its peculiarities under the welding flame.

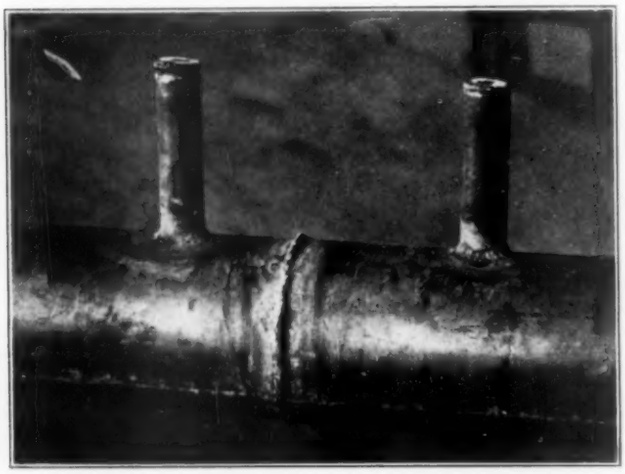
Monel metal is an alloy of nickel and copper containing about 67 per cent nickel, 28 per cent copper, with 5 per cent of other elements such as iron, manganese, silicon and carbon. In appearance Monel metal when new resembles untarnished nickel. Probably the most valuable property of Monel metal is its resistance to corrosion. For that reason it is used extensively in food handling machinery, textile dyeing machinery, photographic tanks, pickling tanks, marine construction and in chemical equipment.

In welding Monel metal a few simple precautions must be observed. First, a neutral flame should be used. The tip should be one or two sizes larger than would be required for steel of the same thickness. Cold drawn Monel metal wire or strips cut from sheet, should be used as welding rod. As a general rule, flux is not required. The oxide film that forms on the surface of the puddle helps to protect the metal underneath from further oxidation. Keeping the outer envelope of the flame spread over the weld area will also aid in excluding air. The rod should be melted under this skin of oxide and slag. Any particles of dirt or foreign matter should be worked up into slag by melting underneath them. Then, when the weld is built up well above the surface, as all Monel metal welds should be, grinding will remove all oxide, slag and impurities, leaving only good sound metal in the weld.

Monel metal castings present a peculiar combination of properties. Like gray cast iron, they are sensitive to sudden temperature changes while under the welding flame. Consequently in welding such castings they must be carefully preheated, welded while hot and allow to cool very slowly. Like cast aluminum, Monel castings have very little strength when hot, so the piece must be properly supported in the preheating furnace in order that the

various parts of the casting do not collapse or distort under their own weight. The casting should be brought to an even dull red heat of about 1,200 deg. F. and the temperature maintained as steady as possible during the welding.

When the weld is completed cover all openings of the preheating furnace with asbestos paper, close the draught holes with sand

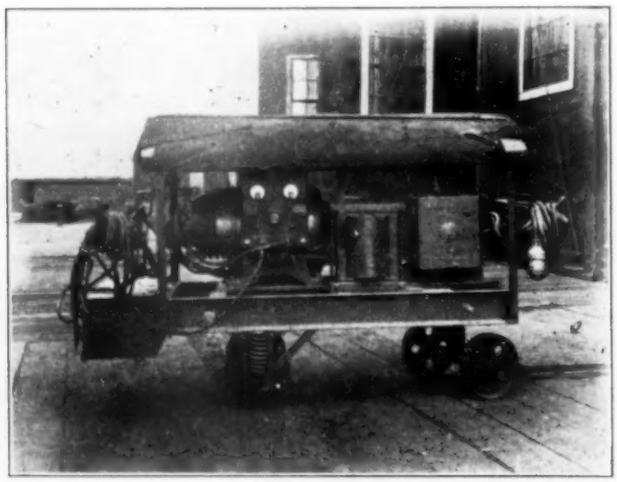


Welded Monel Metal Header Employed in Chemical Plant Operations.

and allow the casting to cool gradually in the dying fire. Do not uncover until the casting is stone cold. It is most important that the annealing process be carefully carried out, as success depends largely upon this factor.

SPRINGS PROLONG LIFE OF WELDING MACHINE

At the Denver shops of the Denver & Salt Lake Railroad the efficiency of this portable Westinghouse electric welding machine was increased and its life prolonged by mounting the rear



The Rear End of This Welding Machine Is Mounted on Springs.

end of the machine on springs, as shown in the illustration. These serve to take up the excess vibration when the machine is being moved over rough ground, as well as when throwing an arc.

The coiled springs are held in place by a light frame of angle irons, built up by welding, and welded to the frame of the machine. This frame slips up and down on the inner frame which contains the boxing of the wheels. The machine also carries two long metal hooks at each end for rolling up the extension cords when on the move, and a canvas cover for keeping out dirt.

A WELDED PORTABLE GRINDER STAND

The flexible shaft grinder is a very much used tool in every welding shop. But frequently the motor is clamped to the work bench, or placed in some other similar position which somewhat limits the use of the grinding wheel, or forces the welder to move his job to the grinder. As a remedy for this, a welder in the shop of the Acme Cutting & Welding Co., Chicago,

This Movable Grinder Stand Is Very Convenient.

constructed the moveable grinder stand shown in the accompanying photograph. It was fabricated by welding ordinary light sheet steel and angle iron. Four rollers from an old dolley were welded to the bottom so that it could be pushed around anywhere in the shop. It has two shelves under the motor platform on which extra grinding wheels and various tools can be kept. The motor stands at about the same height as the welding table and with the flexible shaft and the various size wheels, the welder is able to handle practically any grinding job he comes up against.

THE WELDER AS A MERCHANDISER OF SERVICE

By Willis Parker

"Welders are not obtaining more than 10 per cent of the possible business in their communities," declares C. N. Blanchette, of the Blanchette Welding Works of Denver, Colo. "The reason is that the public has not become fully educated to the economy and practicability of welding, and, while we shall admit that the art of welding has not reached its ultimate heights, we must also admit that the welders should devote more time and effort to educating the public to the advantages and possibilities of welding methods thus far developed.

"This means better finishing; more advertising to reach into wider fields, including the home; better systems of routing work through the shop; adoption of a few retail store merchandising and display items; increasing customer confidence, and rendering of intelligent, helpful service."

Mr. Blanchette's policies relative to the foregoing points are somewhat unusual. Take, for example, the item relative to increasing customer confidence. He believes that the success of

any welding business depends largely upon the confidence the customer has in the welder's judgment.

"When a man comes to a welder to seek assistance in the solutions of a problem, he comes much in the same manner that he consults a physician relative to his health; he's in trouble, and whether his health is likely to be improved by an operation, a change of climate, or following a prescribed course of treatments, including the taking of various pills, powders, etc., depends upon the physician's diagnosis and the patient's confidence in the physician's judgment. Hence we endeavor to fill a position similar to that of a physician. If there is any doubt at all regarding the treatment, we do not hesitate to take the time to visit the customer, examine the job and make our recommendations, which may be the type of welding to be done, or whether welding at all will be more practical or economical than the purchase of a new part for the machine or an entirely new piece of equipment.

"You cannot always tell, from the description that the customer gives you over the telephone, what treatment is best and whether welding will be practical or economical. Therefore, to be absolutely safe ourselves, we jump into a car and visit the prospect, examine the situation and make our recommendations and quote him a price. No, we do not always recommend welding, for it is our belief that our success depends upon saving the customer's money; if welding will not be practical and economical, we do not recommend it, even though we would lose many dollars by so doing.

"We save some money by this method, also, because we have found that not all of the prospects know exactly what kind of electric current they have available, or whether electric or acetylene welding is what they should have. We might arrive on the job with one type of equipment and find we should have another, and have to make a trip back to the shop. If the customer kicks on the price quoted, we decline to reduce the price and give him a job of less than the best work we can turn out. We'd rather lose a customer than to reduce the quality of the work.

"One of the fields of which the welding industry has scarcely scratched the surface, is the Great American Home. There is business to be obtained from every family if we can educate them to what we can do. In an effort to show women as well as men what welding can accomplish, we are very particular with our finishing. Suppose a housewife brings an oven door to us to be welded and we do not finish it properly. It gives her a bad opinion of welders in general and she is through with welding forever. Every time she sees the job, she's sore; every time her friends see it, they obtain a wrong impression of what welders can accomplish. On the other hand, each welding job that satisfies a housewife is an advertisement, for she is so pleased that she will call the attention of all of her friends to it, and the next time they experience a breakage of anything of metal, they will think of the possibilities of salvaging it through welding.

"The same thing is true with the finishing of welds in machinery, particularly in automobiles, which are in many instances a family possession in which the wife and children are as much interested as the head of the house.

"Our system of advertising is based upon the thought that some time, somewhere, somehow, every automobile owner, every manager of an industrial plant, every mine owner, every landlord will have something break that could be salvaged by a competent welder. The majority of them have not thus far had occasion to try welding as a means of solving the problem—the majority of people don't know what it's all about. But if we keep the thought of welding before them all of the time, they will be led to investigate when an accident does occur and give us a chance to demonstrate what we can do.

"Hence the bulk of our advertising is of the direct mail kind. We use postal cards, which cost very little to mail—a one cent stamp will do the work. The cards always bear a picture of some kind of a welding job. But we segregate types of customers and send cards to types instead of to the trade in general. For example, a card bearing a picture of the welding of a giant fly wheel will not appeal particularly to the owner of an apartment house whose problems concern boilers; nor will a card bearing the picture of welding a part of an automobile appeal to the mine owner whose problems concern heavy machinery.

"We obtain our mailing lists from the classified section of the telephone directory, and mail to the various classifications cards pertaining to and appropriate to their types of business. We don't stop with one card, either, but send them out periodically. For a while we mailed cards every two weeks, but now we are sending them out once a month. At some time the card is going to arrive about the time the prospect will be in need of our service, and the card may be on the desk of the manager at the time. At any rate, the continuous presentation of the service, the firm name, etc., is making an impression upon the prospect, and whether or not the card is handy, he will recall that there is such a thing as welding and will be led to investigate. I feel that every time we send out a card we are helping the welding industry in general.

"We believe that cleanliness in the shop is highly important, and that the windows should be washed frequently. We cannot expect to increase the women's trade if we permit slouchy housekeeping. Nor does it make a good impression upon men customers to permit accumulations of dirt on the floor and grime on the windows. Good housekeeping gives the impression of good workmanship."

A CLAMP ON LEGS

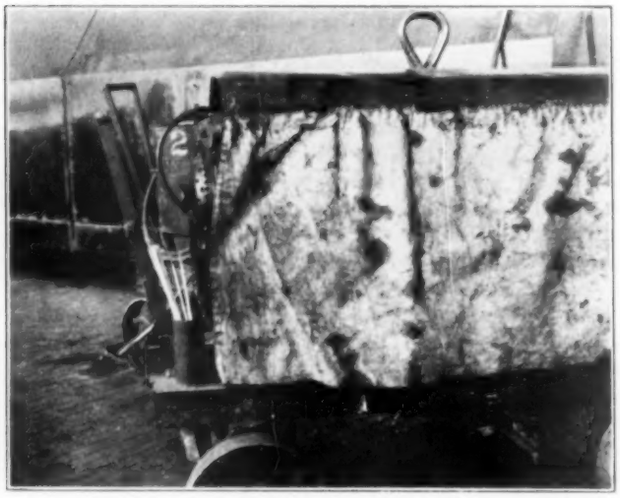
The clamp on legs, shown here, was found to greatly expedite the work of welding large cylindrical tanks of metal, and insure a perfect joint between two sections of the tanks. It consists of a metal band, 8 inches wide, ⅛ inch thick, and long enough to reach around the tank. On one end of the band is a projection of metal 1½ inches at right angles to the surface of the band. On the other end of the band is a flexible clevis, with eighteen-inch handle, one end of which fits against the projection mentioned and draws the two ends together as the handle is drawn back and fastened by a chain. This draws the two ends of the tank absolutely flush, as the band fits directly around the joint.

The Clamp on Legs Speeds Up Production of Cylindrical Tanks.

Four legs of light angle iron, on casters, support the band, and allow it to be readily placed about the tanks and as quickly rolled out of the way. Several 3-inch square holes, around the circumference of the band, allow as many spots to be welded while it is in place. The band is then removed, and the joint welded all the way around. The preliminary spot welds are made with tank standing on end.

MOVING ELECTRIC WELDER WITH CRANE

In many large machine shops much of the work is performed on upper floors, often reached on the interior by a stairway only. To facilitate the use of portable electric welding machines in such a department a Denver shop provided for the easy moving of such machines with the overhead cranes. Two 1-inch rods



This Welding Machine Is Easily Handled by the Shop Crane.

about 6 feet in length were bent until the two ends were about 30 inches apart and the middle formed a six inch loop. The ends of each rod were welded to the frame on one side of the machine, and the two loops brought together at the top. A hook from the crane is quickly inserted in this loop, when the machine is to be moved from the lower to the upper floor, or vice versa. A 7 inch section of 3 inch pipe, on a flat metal base welded to the corner of the machine, is used to hold welding rods when the machine is in use.

A PORTABLE WELDING SHOP GIVES SERVICE IN PORTLAND, ORE.

Walter A. Richards and Don L. Richards, proprietors of the Richards Bros. Welding Works, Portland, Oregon, have recently added to their equipment a portable welding shop. The truck which is illustrated herewith carries a gasoline engine driven arc welding set and also oxy-acetylene welding

View Shows Arrangement of Gas and Electric Welding Equipment on Truck.

equipment, including the gas cylinders. The photograph shows the mounting of the acetylene tank on one side of the truck and the oxygen tank is mounted in a similar fashion on the other side. Convenient rod bins are built underneath the floor proper holding all sizes of both acetylene and electric rods.

Among the shop equipment are found a G. E. motor generator which has been in continuous service since 1926, a U. S. L. motor generator recently added to the equipment and also an U. S. L. Gas driven generator. Victor and Airco welding torches are used.

This company is kept busy for the most part with job work, and are now welding a half dozen of the large roofs at the Richfield gasoline plant. A rather unusual job is the welding on a monster condenser for the Pacific Mining & Smelting Company at Rogue River, Ore.

RECALLS A REPAIR WHICH SAVED $60,000.00

A letter received from a friend who has had years of activity in the welding industry describes a wartime repair job which is sure to interest many of our readers.

"One pleasant afternoon in June of 1918 I was walking along the main street of Salt Lake City when up came a man who had been hurrying to catch me and in a very agitated voice informed me that some miscreant or German sympathizer had dropped a manganese sledge hammer into the rolls of their big zinc ore crusher in a Montana city, with the result that it had broken apart one side of the frame and put the crusher out of

Fig. 1. Photo Shows Heavy Frame-Work of Timbers for Supporting the Casting.

business; and that a new frame could not be made within 60 days. They were losing at least $1,000 daily while it stood idle. Could I take the train leaving within 15 minutes and take charge of welding it?

I instructed him to wire the mine to get the crusher out of the mill into an open space and remove the rolls and to gather all available charcoal, a good supply of brick and a roll of asbestos paper. Sixteen hours later I was riding at 40 miles an hour to the top of the main range of the Rockies. In that time the crusher frame had been moved out and a heavy frame work built of timbers on which chain hoists had been suspended

for moving and turning the frame when required. This crusher frame was of cast iron and stood 5 ft. high, 8 ft. wide and 12 ft. long and had two main webs running the length of the frame each side of the central opening, each pair of the main webs being united by three cross webs intermediate the ends of the frame.

After carefully placing supports for the frame so that when heated it could not sag, the breaks, which consisted of two cracks each in metal averaging 4 in. thick by 5 ft. long, were chipped out. The space between the webs not being sufficient to permit working, all welding had to be done in each case

Fig. 2. Welding on the Pressure Frame Casting.

from one side, which meant that just double the amount of weld metal had to be deposited than would have been the case had it been possible to weld on each side of each web. Building up our brick furnaces to a height of 5 ft. we filled in the charcoal, not only in the pocket in which the break had occurred but also in the pockets each side. It took all day to bring the

Fig. 3. View Shows Covering Over Part Welded.

sides of the frame and the cross webs up to a dull red and then one welder began work, welding up a "V" 4 in. deep by 8 in. face opening by five feet high. This was completed by the middle of the following forenoon when the casting was lifted and laid on its side, the charcoal fires renewed and the break in the inner web welded, the work being completed by early the following morning. More charcoal was then heaped on and the heated section carefully covered to insure even cooling. In all, something over 300 sacks of charcoal was used. No. 15 tips were used and the gas supplied by a 50 lb. generator which was all that was available. One man tended the generator and kept a stream of cold water flowing over the tank. In all it took 48 hours, chipping, preheating, welding, turning the casting and welding. The work was done in a driving snow storm even though it was late in June.

The job proved a complete success and I understand the crusher is in use today. No charge was made the mining company for supervision and direction. It paid the men, and bought the oxygen and carbide and charcoal, and stated that the operation saved them at least $60,000. It was just another of those incidents exemplifying the extent to which industry has been helped by a great and broadminded corporation promoting welding. That such corporations have grown great and prospered exceedingly is to my mind just a proof that they have deserved well of industry in general.

Today, of course, all the details of the dismantling and moving out of the mill, the hundreds of sacks of charcoal, and the time taken to preheat and the discomfort of the welders working in the heat, is a thing of the past. Today that crusher would have been left on its foundation in the mill, the rolls only would have been lifted out, the two vertical "V's" would have been chipped, one welder would have taken his place within the frame and the other welder his position outside the frame, and simultaneously they would have welded the broken webs with a good bronze—at the utmost twelve hours of work instead of 48, with a saving of two days' time, 300 sacks of charcoal and the time for reassembling. But bronze welding was not known in those days as it is today.

TELL UNCLE SAM YOUR VACATION PLANS

Commissioner of Police Russell of Chicago has issued a warning to those who are going on vacation to notify the milkman and newsboy so that some passing yeggman, noting the clutter of milk bottles and folded newspapers around the door, may not make a mental note of the address as a desirable place to visit on some dark night in the future.

There is another phase of the absentee's forgetfulness which is sometimes serious in its consequence, and that is the failure of the vacationist to notify the post office where to send his mail, so that mail of great importance is held until he returns or is returned to writer, often with distressing results.

This is also vacation time in the post office. Under the law, letter carriers must be given fifteen days vacation, exclusive of Sundays and holidays, but vacation or no vacation the mail must move and deliveries must be made. During the absence of the carrier, delivery is made by a substitute who is sometimes limited in experience and he may be unfamiliar with the district and those who live on it. Under the best circumstances, delivery is not an easy task for the experienced carrier, and when a substitute is sent out on the district, delivery is often impossible, according to Postmaster Arthur C. Lueder, of the Chicago post office, because of the failure of patrons to co-operate with the post office by providing a proper receptacle for their mail, with the name of the resident plainly shown above the box.

It is particularly desirable that the names of roomers and visitors who expect mail shall be placed over the box during the period of their stay, or they should have their mail addressed in care of the person whose name is on the box. The Postmaster says that patrons can do a great deal to expedite delivery and make a hard-grinding task easier for the carrier by furnishing a proper mail box with the names plainly shown over it.

GOODMAN CONDUCTS SERVICE DEPARTMENT FOR PROSPECTIVE USERS OF WELDING

The Goodman Electric Machinery Co., of Newark, New Jersey, who deal in both new and rebuilt arc welders and spot welders, now conduct a service department where sample welds are made for prospective users of welding equipment. This department is particularly of service where such metals as aluminum, brass, duralumin or other metals requiring special care are to be welded.

PILE DRIVER WITH HEAVY BASE COMPLETELY ARC WELDED

The heavy base of a pile driver formed of large I beams was constructed entirely by the welding process. This pile driver has now been in use for about one year, and the welds are all in good condition with no signs of cracks or other deterioration. Undoubtedly the welds in this case are subjected to more vibration and strain than occurs in any other structure fabricated from welded structural parts, and the fact that they are still in good condition after nearly a year's hard use is pretty satisfactory proof of the reliability of welding for that use or any similar uses.

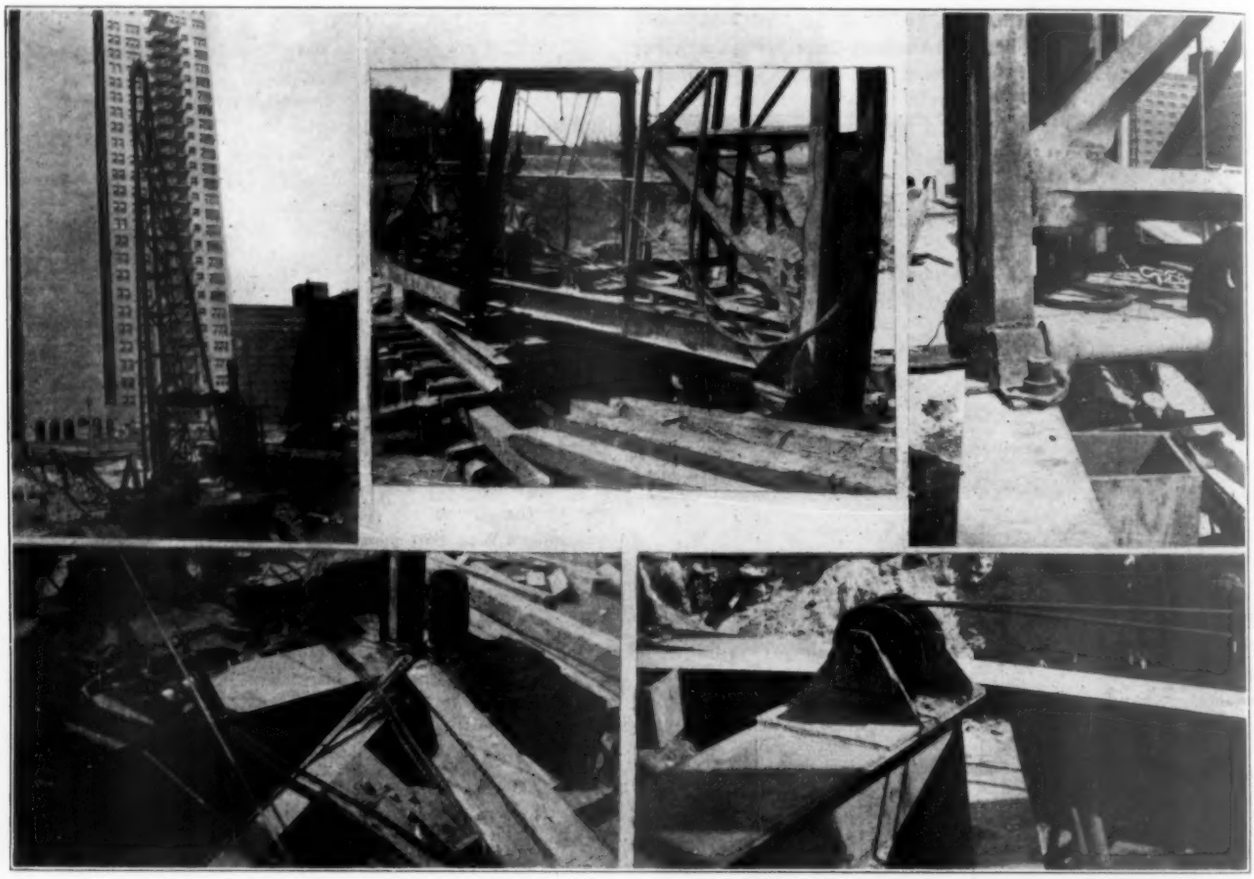


Fig. 1. Shows Size of Pile Driver. Fig. 2. View of the Heavy Base. Figs. 3, 4 and 5. Shows Details of Welded Connections.

As the photographs show, the base of the pile driver consists of two sections one above the other. They are both made of heavy I beams with all connections welded. The lower section serves the purpose of a skid for moving the apparatus around on rollers, and built into it is a turn table. The upper section rests on this and thus can be turned around in any direction. This section was made in the form of an isosceles triangle, the engine resting on the base, and the tower with the driving hammer mounted on the vertex. This tower is just bolted to the base and thus can be easily removed for convenience in transportation. Various detailed views of the use of welding in this structure are shown in figures three, four and five. Figure three is a view of the welding on the frame of the tower near the base. This clearly shows how the joints for the cross braces were formed. The whole tower was made of heavy angle iron, and as is seen, by flattening out the ends to be joined they were able to lay a longer bead of weld metal, and thus increase the strength of the joint. Figures four and five show details of the frame work of the base. Note how the various pulleys and other attachments were easily mounted through the use of welding.

GAS MAKERS READY FOR ACTION

Preparations are now practically complete for the annual mid-summer meeting of the Gas Products Association. This Association is made up of manufacturers of oxygen, oxy-acetylene apparatus and supplies for oxy-acetylene welding and cutting. The date of the meeting is June 20-21-22, and the place selected for it this year is the Golfmore Hotel at Grand Beach, Michigan. The program of meetings includes several papers which will be of considerable interest and importance to manufacturers in the gas welding field and the entertainment committee has made a special effort to provide a generous program of in-door and outdoor sporting events of unusual interest. A number of beautiful prizes have been contributed for these events. Over forty registrations have already been received and it is expected that the total attendance at the meeting will be practically double this number. A full report of the events will be made in the July issue.

BOOK REVIEW

Arc Welding-Lincoln Prize Papers

This 422 page book just published by the McGraw-Hill Book Company, New York City, is a compilation of seven of the papers on arc welding submitted to the American Society of Mechanical Engineers in competition for the Lincoln Prize. The list includes the three prize winning papers, two of which were awarded honorable mention, and two of which were included because of the general interest and value of the manuscripts. The book contains a wealth of information regarding the fundamental principles of arc welding and some of the more important applications of the process in construction work. Several of the papers discuss in detail the specific welding operations used in Naval work. The volume is splendidly illustrated and contains a great fund of practical and useful fundamental welding suggestions. The price is $5.00 per copy.

Welding in the Boeing Plant*

Fuselages Are Welded with the Arc—Some Other Parts Gas Welded and Brazed—Operators Carefully Trained

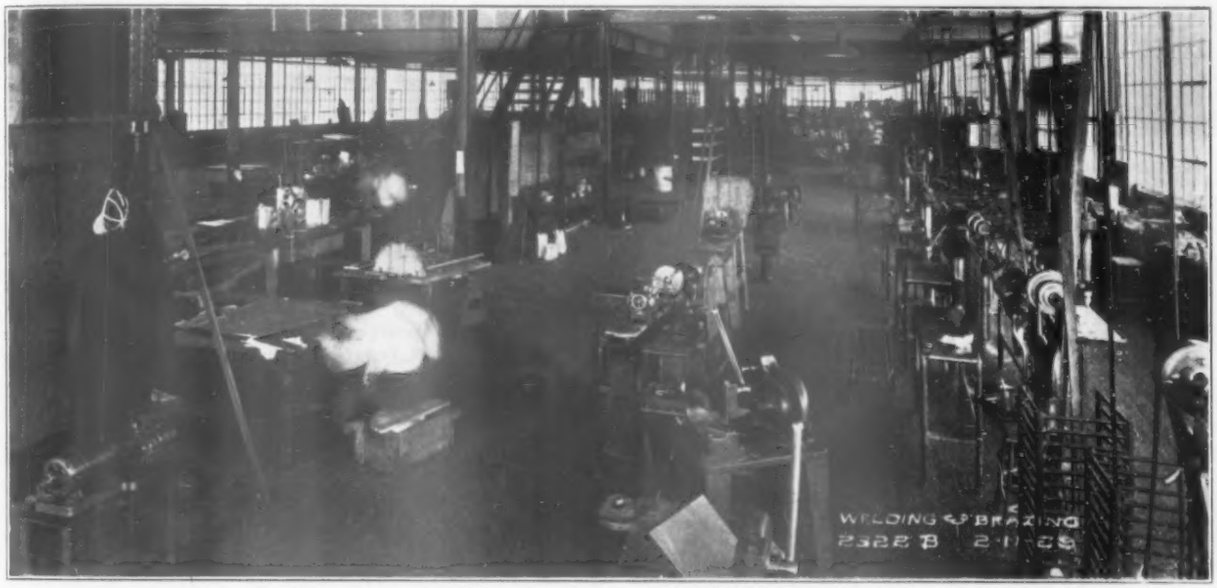
WITH the recent conclusive addition of safety and regularity to speed as standard characteristics of modern air travel, American business interests have accepted it at its full value—an invaluable communicative and transit feature of the well-rounded commercial program, and in doing so have aided in the entrenchment of aviation as an essential element in the great system of national transportation. Speed, the prime attribute of air travel, was in itself sufficiently important to insure a successful future for aviation, but with the steps in the direction of safety taken during the past few years by aeronautical engineers, air transportation has become unquestionably a dominating factor in the commercial life of the nation.

Boeing System, operates the 1100 mile line between Los Angeles and Seattle, which is the second longest daily serviced line in the United States.

Boeing System is the largest commercial air transport company in the nation, recently completing a total of 5,000,000 miles of actual flying. Boeing planes are flown 10,000 miles a day, of which mileage 4,600 is night flying.

As the demand for air transport service steadily increases, the Boeing plant is forced to maintain a high speed of production, and an enlargement of its factory space will soon be necessitated to better accommodate its production facilities.

A proportionate increase in the ranking of the metal shops



Airplane Welding Department. A view of the welding and brazing department of the Boeing Airplane Company at Seattle. Three hundred and twenty-six expert workmen working in this section have maintained a production average of as high as two completed all-steel plane fuselages per working day. All fuselages are assembled in this department, and the joints are electrically welded with equipment developed specially by Boeing engineers. All welds are carefully inspected by company and government inspectors.

Characterizing the period of development and improvement of aircraft since the first sustained flight in the history of the world, which was accomplished twenty-five years ago by the Wright brothers, has been the introduction and the consistent augmentation of metal as a basic material for aircraft construction. The first flying machines were fabricated of wood and linen, but those materials have been gradually but steadily supplanted until today the all-metal plane is not uncommon.

One of the dominating plants in the field of aircraft manufacture in the United States today is the Boeing Airplane Company at Seattle, which is the largest plant in the nation devoted entirely to the construction of air planes. This company has designed and constructed forty-five different models of aircraft, including Army and Navy planes, mail planes, mail-passenger-express planes, seaplanes, "sport" planes, training planes, and multi-motored eighteen-passenger transports.

It is interesting to note that the Boeing System carries approximately thirty per cent of the nation's total air mail, and its planes touch daily at airports in nine states. The Boeing Air Transport operates over the mail-passenger-express route between San Franicsco and Chicago, which is 2000 miles in length—the longest regularly serviced air line in the world. The Pacific Air Transport, also a member of the Boeing Sys-

Photos by Boeing Air Transport System.

of the plant has followed the growing tendency toward increased usage of metal in airplane manufacture, and this unit of the production organization is now the dominant factor in the Boeing plant.

The welding and brazing department is housed in this large unit, along with the machine shops, the sheet metal department and the other divisions of the metal section.

The skeleton of the airplane is assembled in the welding department. The fuselage of the plane, which, as the skeleton, is one of the really vital parts of the plane.

The initial step in the assemblage of the fuselage is, of course, the design, following which the specifications are carefully checked for a list of the required parts, which is submitted to the machine shop or other metal departments for filling.

When the parts are delivered, they are well cleaned and segregated into the desired lengths. Then a steel jig is assembled on a permanent level base of steel. The construction of a jig must be closely checked and approved by trained inspectors before it can be used in assembly work. Then the first fuselage begins to take shape, with a mock-up ship being constructed. Templets of the jointed tubing are made and the mock-up is removed from the jig. Then the materials are cut into the required lengths and actual fuselages are assembled in the jig.

All joints are carefully welded by experienced welders. Torch welding and brazing are used to some extent in aircraft con-

struction, but in structural work such as the fuselage, all parts are electrically welded. As pioneers in the use of electric arc welding in airplane production, the Boeing engineers developed a low voltage, low amperage AC arc welder. Tubes and sheet stock, ranging from .035 to .375 inch thickness are successfully welded.

After the fuselage is removed from the main assembly jig, all welded parts are carefully cleaned and the framework is

The Skeleton of the Boeing Plane. In the above picture are seen several all-steel fuselages in the process of assemblage in the welding and brazing shop in the Boeing Airplane Company's plant at Seattle, which is the largest exclusive manufacturer of aircraft in the nation. In the foreground of the picture are a number of jointed steel tubes which have been produced with special equipment in the machine shop of the plant and subsequently approved by a strict test of inspecting engineers.

oiled throughout. The method used for the oiling process is that of an oiler with a ten pound air pressure, which forces the oil into all recesses of the fuselage. This operation enables the workmen to locate any porous welds, which must be promptly remedied.

Highly expert inspectors then examine the completed fuselage

They Guard Against Imperfect Materials. This is a view of the inspection shop in the center of the metal-working unit of the Boeing Airplane company at Seattle. Every piece of equipment used in the fabrication of Boeing airplanes is thoroughly inspected by both company and government inspectors, and all faulty parts are promptly rejected. For this reason the Boeing System, which recently completed its five millionth mile of actual flying, is enabled to maintain its high standard of reliability and regularity and the same standards are incorporated in all commercial planes.

before it may continue in the assemblage process, and if there be defects in the structural work or the welding, the fuselage is rejected.

Three hundred and twenty-six skilled workmen are employed in the welding and brazing department. As a general rule, the Boeing company attempts to hire none but experienced welders for both the electric and torch welding, but with the developments in electric welding and its application to aircraft construction, it has been found advisable to give all welders a course of training and practice work in aircraft welding. This instruction is under the supervision of an expert welder.

This course includes practice work intended to give the student welders the touch necessary to handle the thinner gauges of materials used in aircraft. After the welder has completed the course with the approval of the leading welder, he is given a series of tests, which usually consist of butt welded tubing samples tested in tension. There is a requirement of a maximum failure for qualification. The methods used in training torch welders are very similar to those used in instructing electric welders. Aluminum welding, being a highly specialized form of torch welding, requires a special training.

The leading welder, who is in charge of instruction, is also in charge of production, and is constantly inspecting all welding operations. It is due to his knowledge of each welder's ability that assignments are made to the various welding operations. Thus the welders of greatest ability are assigned to the most intricate and highly stressed joints in the airplane fuselage. It is by reason of this system, according to Leo Butler, foreman of the Boeing welding department, that the welding processes can be carried out most efficiently and satisfactorily to the inspectors.

WELDING FEATURED IN THE INDUSTRIAL BULLETIN

The May, 1929, issue of the "Industrial Bulletin" contains an interesting article entitled "Welding Makes Progress." This bulletin is published monthly by the Arthur D. Little, Inc., of Cambridge, Mass., and its purpose is to place before bankers, investors, and industrial executives early and authoritative information regarding the present status of industrial development or indicating its probable trend. The article begins by enumerating the various types of welding and then continues as follows:

"Each of these processes has enjoyed certain fields quite independently of the others, due to inherent advantages of its own. As a result of the research activities of The American Welding Society, the American Bureau of Welding, the Bureau of Standards, individual companies, and many of our universities, the procedure necessary to guarantee success in welding processes has been determined and the information has been widely disseminated. Fusion welding rests on a secure foundation today. Its extension into automatic welding has resulted not only in the realization of extraordinary economies in fabricating on a production basis, but in greater strength in joints and almost unlimited freedom in design. Moreover, these results have been accomplished with more dependable results than by older processes."

UNIVERSAL AIR SCHOOLS GIVE WELDING INSTRUCTION

The Smith Welding Equipment Corporation of Minneapolis, Minnesota, has just completed the installation of piping and equipment which will be used in the aeroplane welding course that the Universal Aviation Schools will give at Porterfield Flying School in Kansas City.

The student who takes this aeroplane welding course receives a minimum of 36 hours of instruction and practice. He learns in detail about the operation, care and maintenance of oxy-acetylene welding and cutting equipment. He learns to weld the various kinds of metals and alloys and to make the various types of welded joints used on the modern airplane.

In addition to classroom work, the student is required to do considerable reading in welding text books and publications. This reading, coupled with actual work and practice in the classroom, gives the student a good fundamental and general knowledge of oxy-acetylene practices in addition to training in welding metal parts used by the aviation industry.

AMERICAN WELDING SOCIETY HAS PREPARED WELDING AND CUTTING CODE FOR BUILDING CONSTRUCTION

Copies of a Code for Fusion Welding and Gas Cutting in Building Construction, prepared by the Committee on Building Codes of the American Welding Society are now available for distribution and can be obtained from the Secretary of the society at 33 W. 39th St., New York. The text of the code is as follows:

PREFACE

The increase in the use of welding and gas cutting in the construction and equipment of buildings has brought to the American Welding Society a number of requests from municipal and other authorities for assistance in the formulation of regulations in the revision of existing Building Codes and the compilation of new codes where none is now in force, which will insure the safe and satisfactory use of the processes in the fabrication and erection of structural steel, piping and tankage in building construction.

In response to these requests a Committee on Building Codes was appointed by the President of the American Welding Society to undertake the codification of those practices in the application of fusion welding and gas cutting in building construction which have reached the stage where they may be properly standardized.

Recommended practices in the application of fusion welding and gas cutting to structural steel have been prepared by the Committee and formulated in the accompanying Part A "American Welding Society Code for Fusion Welding and Gas Cutting of Structural Steel," which part has been formally approved by the Society. This document has been so arranged that it may be embodied wholly or in part in existing municipal or other Building Codes. Care has been taken to be conservative in the formulation of this code. The various regulations are based on practices which have been demonstrated to be safe by experience, covering many full size destructive tests and numerous welded building structures erected throughout the country.

This being the first edition of the Code, it has been made as simple and as devoid of details as possible. The Committee is prepared, however, to assist in the interpretation of the Code or its applications. Communications should be addressed to the American Welding Society, 33 West Thirty-ninth Street, New York City. The Society reserves the privilege of publishing inquiries and answers in its Journal, with the name of the inquirer omitted.

Codes dealing with fusion welding and gas cutting, as applied, respectively, to piping and tankage in buildings, are being prepared and will appear as Parts B and C. Other codes will be undertaken as the need for them arises. It is the purpose of these codes to serve and assist all interested in providing safe welded construction and to aid municipal and other authorities responsible for the preparation and enforcement of general building codes in the regulation of construction welding.

Following is the personnel of the Committee on Building Codes as at present constituted:

E. A. Doyle (Chairman)	*The Linde Air Products Co.*
J. L. Anderson	*Air Reduction Sales Company.*
Gilbert D. Fish	*Westinghouse Electric & Mfg. Co.*
F. T. Llewellyn	*U. S. Steel Corporation.*
F. P. McKibben	*The General Electric Company.*
H. H. Moss	*The Linde Air Products Co.*
James W. Owens	*Newport News Shipbuilding & Dry Dock Co.*
Edmund Vom Steeg	*General Electric Company.*

The Committee is authorized at all times to call for advice and assistance from responsible members of National Technical and Regulatory bodies in the work of preparing Welding Codes and the Committee proposes to enlist such aid as the needs arise.

F. T. Llewellyn, President,
American Welding Society.

CODE FOR FUSION WELDING AND GAS CUTTING IN BUILDING CONSTRUCTION

Part A—Structural Steel

Section 1. General Application

1. Fusion welding may be substituted for or used in combination with the riveting, bolting or other requirements already prescribed in the building code of the City of ————, hereinafter called the "Building Code," for connecting together, or assembling the component parts of, steel beams, girders, lintels, trusses, columns and other structural steel used in building construction; provided that the welding be done in accordance with Sections 3 to 7, inclusive, of this code.

2. Gas cutting may be substituted for shearing or sawing in the fabrication of structural steel members or parts, used in building construction, provided the cutting be done in accordance with Section 8 of this code.

Section 2. Definitions

The definitions of welding terms, as approved and published by the American Welding Society, shall govern for any welding terms appearing in this code.

For convenience, some of the more common terms have been included herein, and their specific applications under this code are defined as follows:

1. *Fusion Welding*—The process of joining metal parts in the molten, or molten and vapor states, without the application of mechanical pressure or blows.

Under this code, fusion welding is restricted to the arc and gas welding processes.

2. *Root*—The zone at the bottom of the cross-sectional space provided to contain a fusion weld.

3. *Throat*—The minimum thickness of a weld along a straight line passing through the root.

Under this code the throat of a fillet weld shall be the distance along a line from the root to the hypotenuse at right angles thereto, of the largest isosceles right triangle that can be constructed in the cross-section of the fillet weld; and the throat of a butt weld shall be equal to the thickness of the thinner part joined.

4. *Fillet Weld*—A weld of approximately triangular cross-section, whose throat lies in a plane disposed approximately 45 degrees with respect to the surfaces of the parts joined.

The *size of a fillet weld* shall be expressed in terms of the width in inches of its adjacent fused sides.

5. *Butt Weld*—A weld whose throat lies in a plane disposed approximately 90 degrees with respect to the surfaces of at least one of the parts joined.

The *size of a butt weld* shall be expressed in terms of its net or unreinforced throat dimension in inches.

6. *Weld Length*—The length of a weld shall be considered to be the unbroken length of the full cross-section of the weld exclusive of the length of any craters.

7. *Weld Dimensions*—Under this code the dimensions of a weld shall be expressed in terms of its size and length.

8. *Gas Cutting*—The process of severing ferrous metals by means of the chemical behavior of oxygen, in the presence of ferrous metals at high temperatures, to produce a kerf or cut of uniform width without burning the edges of the kerf or cut.

Section 3. Materials

1. The grade of structural steel to be used under this code shall be that already prescribed in the Building Code.

2. The electrodes, welding wire and/or welding rods, shall either be one of the grades specified by the American Bureau of Welding in its Bulletin No. 2, or some equally good grade which, in the hands of an experienced welder, shows good weldability in flat, vertical and overhead positions. In the discretion of the Superintendent of Buildings it may be required to show the strength specified in Paragraphs c and g, Section B, of the American Bureau of Welding Specifications.

Section 4. Permissible Unit Stresses

1. Welded joints shall be proportioned so that the loads specified in the Building Code shall not cause stresses therein to exceed the following amounts in pounds per square inch:

Shear on section through throat of weld	11,300
Tension on section through throat of weld	13,000
Compression on section through throat of weld	15,000

Maximum fiber stresses due to bending shall not exceed the values prescribed above for tension and compression respectively.

2. In designing welded joints adequate provision shall be made for bending stresses due to eccentricity, if any, in the disposition or section of base metal parts.

Section 5. Design

1. The architect or engineer designing or supervising a welded structure shall be experienced and skilled in such work.

2. *Plate Girders*—Girders shall be proportioned either by their moments of inertia or by the flange area method. In applying the flange area method to welded girders having no holes in the web, one-sixth of the web area may be considered a part of each flange area.

Stiffeners may be either angles or flat bars, welded to the top and bottom flanges, and to the web, by continuous or intermittent fillet welds designed to transmit the stresses.

Connection of component parts of flanges to each other and of flanges to web shall be by continuous or intermittent fillet welds designed to transmit the stress.

3. *Beams*—The use of continuous beams and girders, designed in accordance with accepted engineering principles, shall be permitted provided that their welded connections be designed to transmit the stresses to which they may be subjected.

The connections at the ends of non-continuous beams shall be designed so as to avoid excessive secondary stresses due to bending.

4. *Columns*—Fillet welds connecting the component parts of a built-up column may be either continuous or intermittent. If intermittent, the length of each weld at the ends of the column shall be equal to the least width of the column. The length of the intervening welds shall be not less than 1½ inches, spaced not more than 4 inches in the clear. The size, length and spacing of the fillet welds shall be such as to provide the same strength, per unit of column length, as the rivets specified elsewhere in the Building Code.

Lattice bars and tie plates, if used, shall be welded so as to secure strength equal to those of the rivets specified therefor elsewhere in the Building Code.

5. *Butt Joints*—The edges of base metal parts, ¼ inch or more in thickness, transmitting stress by means of butt welds shall be beveled. For single and double vee joints, the bevel of each part shall be not less than 30 deg., thus forming an open space with an angle of not less than 60 deg. For single and double bevel joints, the bevel shall be not less than 45 deg.

Before welding, the root edge or face of one part shall be separated from the root edge or face of the other part by the spacing given for butt joints on pages 22 to 28 inclusive, of Section E of American Bureau of Welding Specifications.

All butt welds shall be reinforced by depositing additional metal on the weld to a height extending beyond the surface of the thinnest part joined. The height of said reinforcement shall be not less than the following percentages of the thickness of the thinnest part joined:—20 per cent for single vee and single bevel butt welds, and 12½ per cent. on each side, for double vee and double bevel butt welds.

SECTION 6. WORKMANSHIP

1. Contractors for welding structures shall be required to satisfy the Superintendent of Buildings as to their ability to produce satisfactory welded joints of the forms specified, and with the process (arc or gas), materials and equipment to be used on the proposed work.

2. The quality of welds permitted under this code shall conform to the practice recommended in Section D of the American Bureau of Welding Specifications.

3. Surfaces to be welded shall be free from loose mill scale, rust, paint or other foreign matter. A thin coat of linseed oil or equivalent, over the surfaces to be welded, need not be removed. This provision applies both in the case of new structures and where new steel is to be welded to steel in an existing structure.

4. In assembling and during welding, the component parts of a built-up member shall be held by sufficient clamps, or other adequate means, to hold the parts in proper relation for welding.

SECTION 7. ERECTION

1. Structural steel parts shall not be painted before they are welded. Parts that are welded in the shop, to be erected by bolts or rivets, shall receive the usual painting after the shop welding is finished. Parts to be field welded shall receive a coat of linseed oil after shop work is completed, and after erection and field welding, they shall receive as many coats of paint as the total number specified elsewhere in the Building Code for shop and field painting.

2. For all welded structures over 30 ft. in height, erection bolts, or equivalent means shall be employed for temporarily supporting the members and for insuring proper alignment.

SECTION 8. GAS CUTTING

1. The contractor shall be required to satisfy the Superintendent of Buildings as to his ability to produce satisfactory gas cuts.

2. Gas cut edges shall be smooth and regular in contour.

3. Gas cutting may be used in the preparation of base metal parts for welding, provided the edges so cut are thoroughly cleaned after cutting so as to expose clean steel.

4. Gas cutting shall not be permitted to replace the milling of surfaces specified elsewhere in the Building Code.

5. Gas cutting shall not be permitted on any member while it is carrying stress. This restriction shall not apply to detail cutting for the correction of minor fabricating errors, where the removal of metal resulting from such gas cutting would not reduce the required strength of the member that is to be cut.

6. Gas cutting of holes in a member which has not been designed therefor shall not be permitted.

WELDED SIX-STORY STEEL OFFICE BUILDING

By Milton Baruch*

A LONG step forward in the progress of building construction throughout the country was taken recently with completion of the skeleton of the West's first field-welded steel-frame office structure, the new six-story addition to the Pacific

Fig. 1. All Welded Steel Frame Addition for Pacific Mutual Bldg.

Mutual Life Insurance Company home office at Sixth and Olive Streets, Los Angeles, California.

Several buildings in eastern cities have employed the electric arc welding method in assembling steel members in the field, and all reports show that the practice has been uniformly satisfactory.

Application of this process was particularly successful in the Pacific Mutual job, and how well it worked out is shown by the fact that no "grief" was met during the erection of the frame, and welding was completed in a total of 19 days elapsed time.

The new building in this case was being reared in a space that had served as a light court, surrounded on three sides by offices. For this reason decision was reached to use arc welding when it became evident that the noise coincident with riveting of the steel frame would be a serious disturbance to adjacent offices.

The structure is of the ordinary column and beam type of construction, six stories in height. The columns are rolled "H" sections and the beams of the ordinary rolled "I" type.

For the most part, all loads are carried on brackets which were shop-riveted to the columns. The seat angles of these brackets were punched with two holes to facilitate erection and plumbing, and the bottom flanges of the beams in turn punched to match the seat angles. After erection and plumbing, the beams were arc-welded to the seat angles and the top flange of

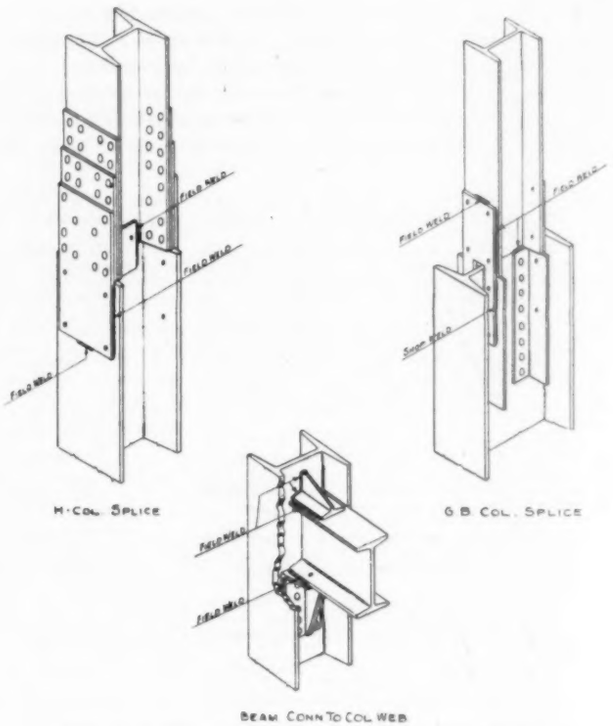


Fig. 2. Welded Connections of Columns and Beams.

the beam secured to the column by welding on connections of various shapes to suit the varying conditions.

The work of welding was well programmed in advance and the difficulties usually attendant on the introduction of a new process were wholly lacking.

Three welders, using the portable type, 300-ampere arc-welding machine, were required for the job. The indicated machine voltage was held at approximately 20, giving an arc voltage of about 16. A hundred feet of 00 cable was used between the machine and the arc.

Rigid inspection both during and following welding operations failed to reveal any defects in the joints, and the results ob-

Vice President in charge of Sales and Engineering, Consolidated Steel Corporation, Los Angeles.

tained were such that it seems certain that arc-welding in the field has taken its place among the established practices in building construction.

Fig. 3. Arc Welding a Column Splice.

Paul E. Jeffers, structural engineer, was in charge of design of the building. Architects were John and Donald B. Parkinson.

WELDED BUILDINGS INCREASE 50% IN ONE YEAR

The number of buildings erected by the use of electric arc welding has increased 50 per cent during the space of one year, according to a list prepared by Frank P. McKibben, nationally known authority on the subject. In a list published under his name in the General Electric Review for July, 1928, 100 structures were mentioned, including bridges, buildings, cars, cranes, frames and towers, ships, tanks, tests, etc., and this total, according to the revised figures, is now 138.

In the list of a year ago, the number of welded buildings was 43, and the present total is given as 65. If to this total are added bridges and ships, the total is 95 as against 63 for a year ago, each item increased by the same percentage.

Three interesting developments are pointed out by McKibben as occurring during the 12 months period. He says:

"The most notable advance has been in the increased height and size of buildings in which arc welding has been used. As evidence of this, one need point to the outstanding examples of the steam power plant of the hotels Chalfont and Haddon Hall in Atlantic City and the new Hotel Homestead, Hot Springs, Virginia; with heights of 150 and 180 feet respectively.

"A second interesting development is the comparative ease by which existing steel bridges are strengthened by welding new steel to corroded or over-stressed members, a process applied not only to highway structures but to steam railroad bridges as well. Indeed, welding could ask for no better endorsement than this adoption by some of the leading railway systems of the world.

"Of no less interest than the two above mentioned phases of welding progress is the changed attitude toward welding exhibited by many officials of municipal building departments who are permitted welding and at the same time are modifying their building codes to authorize welding of steel building frames. Among the most interesting developments in building codes has been the publication of a uniform building code by the Pacific Coast Building Officials Conference, section 2710 of which covers welding, and its adoption by over 40 towns and cities, thus legalizing the construction of welded buildings. The Pennsylvania Legislature has passed a law permitting building departments of cities of the first class to adopt rules and regulations to cover welding, and the American Welding Society has also formulated a code applicable to welding of steel building frames."

According to McKibben, such legislation is needed throughout the entire country. "This method of construction," he says, "has been successfully applied to many buildings in this country, varying in height from one to eleven stories, the one containing the greatest amount of steel being a factory building constructed by the General Electric Company in Philadelphia. So many successful applications have been made that the process has been removed from the realm of experimentation and its usefulness is established as a satisfactory tool for constructive effort, not only in structural work but also in many other fields."

OBITUARY

Mrs. Alexander F. Jenkins

During the past month we have with great sorrow received a report of the death of Mrs. Alexander F. Jenkins, wife of Mr. Alexander F. Jenkins, President and Treasurer of the Alexander Milburn Company, Baltimore, Maryland. Mrs. Jenkins passed away on May 22nd after a lengthy and very severe illness. She was known personally to many of those who are identified with the oxy-acetylene manufacturing industry because of her personal activities in the conduct of the business of the Alexander Milburn Company, and the deep interest which she took in all of the affairs of the industry. Through her attendance at many of the important meetings and conventions which have been held in recent years her acquaintance in this field had become very large and on account of her popularity her presence was always sought at these meetings. Those of our readers who have had the pleasure of meeting Mrs. Jenkins on these and other occasions will join us in extending our sincere sympathy to Mr. Jenkins on the loss of his accomplished and devoted wife.

Frank A. Boyer

Mr. Frank A. Boyer, founder and president of the Standard Steel & Wire Co., died Saturday, June 1st, at 8:30 p. m. in St. Margaret's Memorial hospital at Pittsburgh, where he had been a patient for a month. Mr. Boyer had suffered from a complication of ailments for the past three months.

Mr. Boyer was also one of the founders of the Weldcraft Equipment Co., of Pittsburgh and was affiliated with this company also at the time of his death.

Realizing the great future in the welding industry and the demand for a high grade welding wire Mr. Boyer organized the Standard Steel & Wire Co., with offices in Greensburg, Pa., and a modern mill at Bolivar, Pa.

Throughout the welding industry he was noted as an authority and was untiring in his efforts to bring about the highest efficiency in welding and had made for himself many friends in the industry.

Mr. Boyer was born at Mercer, Pa., June 2, 1883. He attended the Mercersburg Academy. Funeral services were held from his late residence at Walnut St., Blairsville, Pa., interment in the Greenwood Cemetery, Indiana, Pa.

Mr. Boyer is survived by his widow, Mrs. Bess Rugh Boyer, and one daughter Anna Margaret Boyer.

CUTTING TORCH PLAYS IMPORTANT PART IN WRECKING JOB

A well known firm of dealers in scrap iron has recently taken over the job of wrecking an abandoned steel plant located on 95th Street and the Calumet River, Chicago, Illinois. The whole of the plant and equipment being scrapped may be said to consist of just two materials, brick and steel. The brick work is being removed by the pick and shovel method aided by a little blasting occasionally. The immense amount of steel work, part of which one sees in Figure 1, is being felled and cut up by eight men equipped with cutting torches and using Carbo-Hydrogen and oxygen as the cutting gases. An interesting and important phase of the job is found in the fact that the superintendent in charge has seen to it that the cutters employed have had careful training in regard to the efficient and economical operation of the cutting torch. They have been taught to cut the various thicknesses of metal with a minimum of pressures on either of the gases. They have been instructed carefully in the use of the torch itself, and trained in laying out their work well in advance so that when once started they may continue cutting with only an infrequent number of stops. The more feet cut per hour, the more scrap iron there is turned out per day. The company in charge of this job realizes that by efficient use of their cutting equipment they will be helped in obtaining that fair return on their investment which every firm desires.

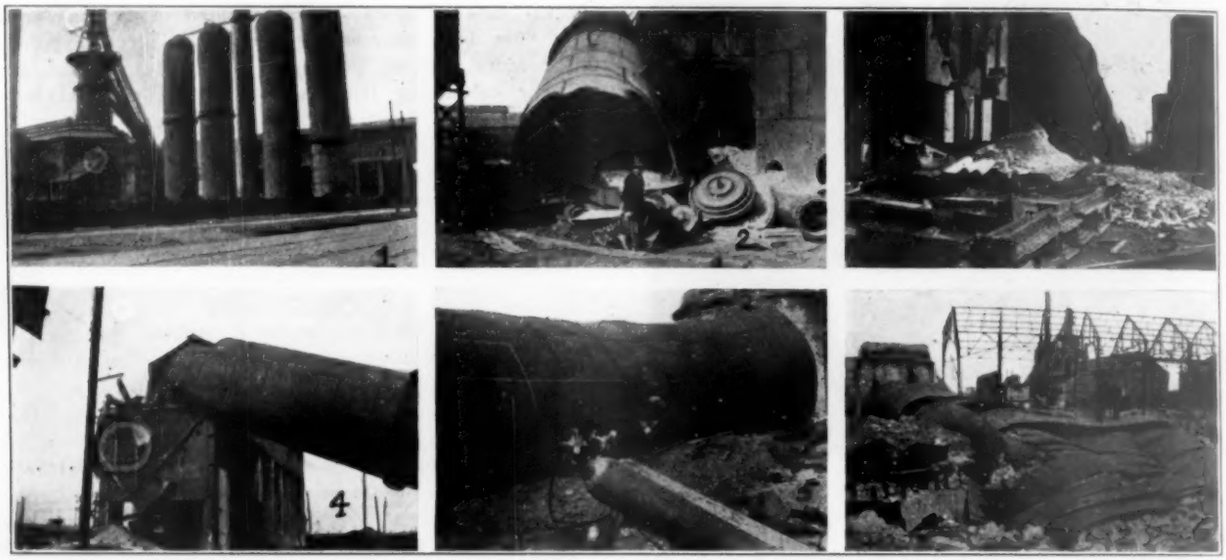


Fig. 1. General View of Old Steel Plant. Fig. 2. View at Base of a Tower After Being Cut Down. Fig. 3. Parts of Bin Cut Up for Removal. Fig. 4. View of Tower and Bins. Fig. 5. Cutting Up the Old Stack. Fig. 6. Sections Cut to Charging Box Size.

As one may see in the pictures above, all the steel is being cut up into charging-box size right at the spot where it lies. The large stack which is shown being cut up, in Figures 2 and 3, was lined with brick, and in order to bring it down the steel sheathing around the base was cut away. Then a blast was set off so as to throw it into a cleared space. Once on the ground it was an easy matter to cut up. Figures 4 and 5 show one of the towers of the plant after it had been literally felled with the torch. Figure 5 also shows the heavy steel work of a bin cut up into charging box sizes right where it lay after being cut from its base. This scrap is loaded into cars and shipped out, so that this old plant may be said to be in its final stage of production, the production of scrap steel with the raw material rapidly diminishing. The final shut-down will leave nothing but bare ground.

SILVER SOLDERS

By R. R. Shuman

Solders containing silver have been used for many years in the manufacture of silverware and jewelry. Very recently, it has become generally known that they have qualities which can be applied to the manufacture of metal parts in many industries. Research by Handy and Harman, the leading fabricators of precious metals, has led to perfection and standardization of compositions so that now there is a silver solder available to meet almost any condition.

Following are some brief comments on the characteristics of silver solders as a group:

Melting Temperatures

They bridge the melting temperature gap between the lead-and-tin solders and the spelter or brass solders. Melting points range from 1325 degrees to 1600 degrees Fahrenheit. Soft solders are easy to use but are not strong. Base metal hard solders are strong, but they must be used with such high temperatures that often the metal on which used is melted, or at least weakened. Silver solders melt enough lower to give a margin of safety and can be used practicably even on extruded brass or bronze.

Vibration

Silver solders stand up under vibration, as is demonstrated by the fact that the United States Government requires their use in certain parts of airplane construction where the vibration is heavy. They are used on delicate vibrating parts of radio loud-speakers and in many other ways where vibration is a factor.

Shock

Silver solder joints are usually stronger than the parts themselves, the tensile strength usually ranging from 40,000 to 60,000 pounds per square inch.

Soundness

They are so free-flowing that the solder penetrates quickly and deeply into all parts of the joint, making a solder bond that is free from pits or pin holes. Therefore, they are used wherever a joint is required that will be leak-tight, either for gas or liquid.

Corrosion Resistance

The high corrosion-resistance of silver solders makes them suitable for building or repairing chemical and food apparatus, soda fountains, etc.

Electrical Conductivity

Silver is a better conductor than copper, even, and silver solders made for the purpose have a high electrical conductivity.

Neat—Compact

Only a film of silver solder is needed, therefore, it is desirable for joints on brass and bronze fixtures where the joint must match in color and be inconspicuous. For the same reason silver solder is widely used for joining the ends of band saws.

Speed in Using

As silver solders flow at relatively low temperatures and flow freely, they are quick and easy to use. Important saving in unit-cost on quantity-production schedules is noted by silver-brazers.

Metal They Join

They will make strong, sound joints on any metals having melting points higher than 1400 degrees Fahrenheit. They are particularly suitable for copper, brass, bronze, monel, nickel and various alloys of steel, including stainless steel.

C. G. M. A. SUMMER MEETING

The Summer meeting of the Compressed Gas Manufacturers' Association, held at Seaview Golf Club, Absecon, N. J., on June 6th, was attended by:

F. R. Fetherston; A. A. Heller; W. F. McKay; L. F. Loutrel; C. B. Armstrong; C. H. Stevens; L. A. Hull; C. E. Cooper; F. A. Johnston; H. W. Smead; R. B. Davidson; C. L. Gulick; W. C. Kelley; R. A. Sossong; J. J. Crowe; E. C. Turner; L. W. Hench; J. C. Minor; J. A. Millholland; G. W. Morrison; M. C. Davison; R. W. Douglass; J. M. Moreton; Col. G. E. Carleton; W. S. Schoenthaler; C. D. W. Gibson; R. E. Bruckner; H. M. Hooker; R. W. Hooker; J. Carlisle Swaim; G. H. Lindsay; J. N. Walker; C. C. Trees; F. S. Austin; G. E. Oetter; H. W. Cole; H. Cook; H. M. Mabey; W. W. Robertson; R. J. Quinn; E. C. Curtis; W. B. Campbell; A. B. Cameron; J. A. Janney; H. B. Pearson; T. P. Arnold; N. E. Bartlett; E. M. Sexton; W. B. Barnes; J. J. Dunne; A. Roy Robson; E. A. Doyle; H. D. Edwards; F. J. King; H. S. Smith; Ed. Rowland; Henry Bower and J. R. Foran.

A special car was run from New York to Atlantic City on Thursday, June 6th.

An informal meeting was held over the dinner table the same evening; President H. M. Hooker retiring before the expiration of the meeting, and Vice-President E. C. Turner taking charge. The new service that the Association is instituting for the recovery of astray cylinders was discussed, generally. Many valuable suggestions were made and it was announced at this meeting that the plan had received such unanimous response from the membership that the committee was urged to lose no time in putting it into effect.

The golf contests were well patronized. Mr. G. E. Pettee of the Liquid Carbonic Corporation deserves first mention for having made a 74 in his first round of play. There were several other scores in this round under 80.

Low Gross Prizes Were Won by

Mr. G. E. Pettee—Liquid Carbonic Corporation.
Mr. R. B. Davidson—Air Reduction Company.
Mr. G. W. Lindsay—Union Carbide Sales Co.
Mr. F. R. Fetherston—Compressed Gas Mfrs. Assn.

Low Net Prizes Were Won by

Mr. W. W. Robertson—Armour Ammonia Works.
Mr. J. J. Crowe—Air Reduction Co.
Mr. W. S. Schoenthaler—Air Reduction Co.

Kickers Handicap Prizes Were Won by

Mr. H. L. Cook—Liquid Carbonic Corp.
Mr. J. R. Eldridge—Virginia Smelting Co.
Mr. G. W. Morrison—Ingersoll-Rand Co.
Mr. Henry Bower—Hy. Bower Chemical Mfg. Co.

Low Net Score for the Minor Trophy was turned in by J. J. Crowe.

Low Gross Score for the President H. S. Smith Trophy resulted in a tie between Messrs. Pettee and Lindsay. Arrangements are being made for these gentlemen to play off the tie on another course.

A special prize of a set of matched irons was presented by the Ingersoll-Rand Company. Representatives of this company designated a round of play and specified that the winner would be the contestants whose score was nearest to 75 plus the count of six dice. This coveted prize was awarded to Mr. R. W. Hooker of the Hooker Electrochemical Company.

A bridge prize was won by Mr. C. H. Stevens of the Air Reduction Company with a high score of 2773 for four consecutive rubbers.

Mr. J. A. Millholland of Wm. Wharton, Jr., & Company, won the Tennis Tournament and was awarded an appropriate prize.

EDWARD RYERSON, JR., ELECTED PRESIDENT OF JOSEPH T. RYERSON & SON, INC.

Mr. Edward L. Ryerson, Jr., has been elected President of Joseph T. Ryerson and Son, Inc., succeeding Mr. Joseph T. Ryerson.

Mr. Joseph T. Ryerson will remain a member of the Board and continue to hold the office of Treasurer.

Edward L. Ryerson, Jr., has had twenty years experience

Mr. Edward L. Ryerson

in the operating and marketing divisions of the business and brings a wealth of practical experience to the post of President. He was graduated from Sheffield Scientific School (Yale) in 1908 and later attended the Massachusetts Institute of Technology.

Coming to Ryerson Company in 1909, he began in the plant operating department and held the position of Works Manager for several years prior to the war. Mr. Ryerson entered the service early in the war with the Aircraft Production Board in Washington and was later captain in the Air Service Division of the Signal Corps. He was elected Vice-President of the firm in 1922 and Vice-President and General Manager in 1928. He is a member of the Board of Trustees of the University of Chicago and a director of the Northern Trust Company and the Quaker Oats Company. He is also President of the Chicago Council of Social Agencies and active in many other civic enterprises. He is a member of the Chicago, Commercial, University, Union League, Shore Acres and other clubs.

The Ryerson Company now in its 87th year is the largest independent steel warehousing organization in the world, furnishing a complete line of steel products for industrial and in fact universal consumption. Their plants are located at Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Buffalo, Boston, Cleveland, and Jersey City.

RAMBO WITH WELDERS SUPPLY COMPANY

The Welders Supply Company of Tulsa, Houston and Dallas, has just announced the opening of a new branch store at 1403 Caroline Street, Houston, Texas. This branch will be in charge of Mr. C. W. Rambo, who has specialized in the sale of oxy-acetylene and electric welding equipment and supplies for the past twelve years. The company will carry a complete line of Stoody products and Mr. Rambo has for five years been associated with distributors of those products.

WILL REPRESENT NORTHWESTERN IN WISCONSIN AND NORTHERN ILLINOIS

Announcement has been received that the Northwestern Manufacturing Company, Milwaukee, Wis., manufacturers of the Hansen electric arc welder, have appointed the Welding

Mr. Arthur H. Friese

Engineering Company, 1154-41st Street, Milwaukee, as representatives in Wisconsin and northern Illinois. Mr. Arthur H. Friese, President of the Welding Engineering Company, is well known in both the Wisconsin and the northern Illinois territory, having represented one of the large manufacturers of electric arc welding equipment in the territory for the past ten years.

MAKES AN AIRPLANE OF WELDING SUPPLIES

At the Aviation Show which was held in Indianapolis, Ind., May 27th to June 2nd, the Indiana Oxygen Co. was represented

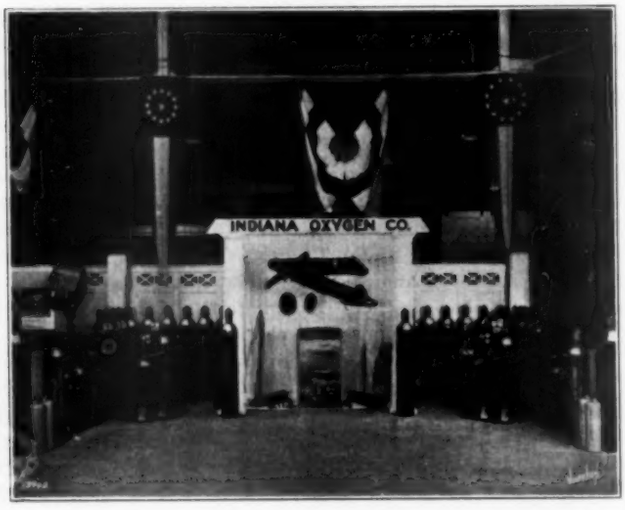


Exhibit of Indiana Oxygen Co. at Aviation Show, Indianapolis, Ind.

by the booth shown in the illustration. The reproduction of the airplane, which is seen in the center of the picture is made up entirely of products sold by the Indiana Oxygen Co. The fuselage is made of a 200 foot cylinder with the cap attached in the usual way. On the six sides of this cap, cylinder valves were attached to represent the cylinders of an airplane motor. The propeller is made of two small hospital cylinders and wings are made of carbide cans pressed down and shaped. The rudder and elevators on the rear of the fuselage and the wheels were made of the tops of the carbide cans and the landing gear made of welding rod.

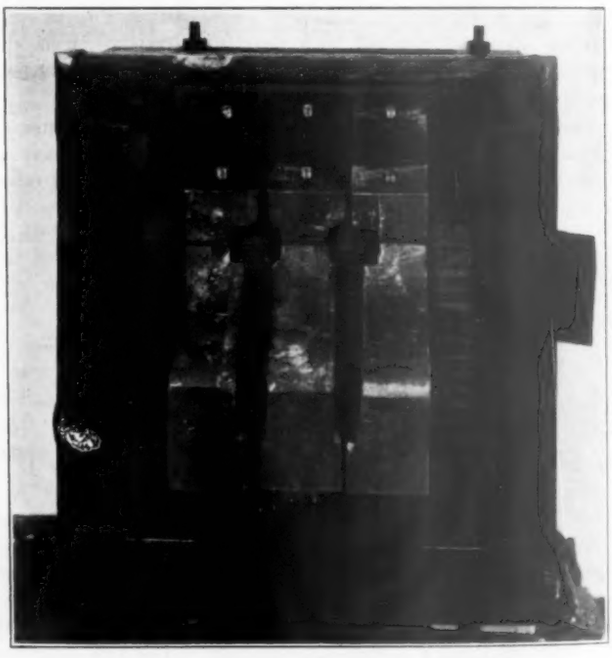
TOM THE WELDER ANNOUNCES SIX WELDING COURSES

The school of welding conducted by Tom The Welder, 7421 Alameda Blvd., Los Angeles, describes, in a folder which they have recently issued, a total of six welding courses. Three of these are courses in electric welding, respectivley 80 hours, 60 hours and 40 hours and three of these are in oxy-acetylene welding covering the same periods. The equipment of the oxy-acetylene instruction department comprizes 14 complete Oxweld welding outfits and one cutting outfit, with 14 individual work benches and one cutting table. The electric welding department comprises 2 Lincoln, 2 General Electric welders, and one Hansen welder, each student being given an opportunity to operate all machines in the course of his instruction. Each machine is in an individual booth and each booth is equipped with all necessary accessories. Students are given individual instruction and are instructed in the fundamentals and principles which constitute the making of a sound weld. They are also taught to make tests which are always given a welder before he qualifies for a welding job.

GIBBS WATER-COOLED WELDING TRANSFORMER

A new water-cooled transformer, designed for A. C. welding, has been developed by Gibbs Welding Machines Company, Bay City, Mich. Several new features have been incorporated into the design of this Type "J" welder. The square iron core and the arrangement of the primary coils and secondary loops is said to give a high power factor and to minimize magnetic leakage.

The cast copper secondary is water-cooled, and it supplies the



New Water Cooled Transformer for AC Welding.

cooling medium for the primary winding as well. The arrangement for the higher heats is such that the two inside primary coils are the working coils, and they are entirely surrounded by the water-cooled secondaries, creating a water-cooled condition.

Pure mica and asbestos tape are used to insulate the primary windings. These materials have great dielectric strength and offer the greatest resistance to heat.

The double tap system for heat regulation is controlled by a

tow-handled regulator, with taps on one side for each range of heat, and on the other for each heat point. Various combinations of point and range give many stages and a fine gradation of welding heat.

LADUE APPOINTED SOUTHWEST DISTRICT MANAGER FOR BASTIAN-BLESSING

The Southwest Welding Supply Company of Dallas, Texas has been selling and servicing Rego oxy-acetylene equipment made by The Bastian-Blessing Co., of Chicago, for a good many years in the Southwest territory. In addition to the Rego line, they also distributed and serviced other items such as supplies and accessories to the welding industry. The volume of business has increased so rapidly in the last few years that the Bastian-Blessing Co. found it necessary to arrange to have the organization of this company give its entire attention exclusively to their product. In order to accomplish that result, the Southwest Welding Supply Company was discontinued; its stock of welding supplies and accessories, furniture and trucks was sold to the Welders Supply Company of Dallas and the Chicago concern have taken into its own organization the sales force of the Southwest Welding Supply Company. Milton J. LaDue, former manager of the company, becomes the Bastian-Blessing district sales manager for the whole Southwest territory, effective May 1, 1929. Mr. LaDue has a great many years experience in the welding industry and is well known through the Southwest.

MULTI-STAGE REGULATOR DOES THE WORK OF TWO REGULATORS IN SERIES

The Harris Calorific Company of Cleveland, Ohio, are announcing the completion of research work which has extended over a goodly period of time relative to the regulator problem. The Multi-Stage Regulator, which they are now manufacturing, is radical in principle and design.

New Harris Multi-Stage Regulator

The evolution of the Harris Calorific Company has been rather interesting. The company was founded in the year 1905 by one of the pioneers in the industry, Mr. John Harris, and therefore claims the title of the oldest manufacturer of gas welding and cutting equipment in America. The original company pioneered apparatus particularly in the cutting field, where gases other than acetylene were used as a part of the preheating medium. In the year 1926 a merger between the Harris Calorific Company and the United States Welding Company, Incorporated, of Minneapolis, was effected by Mr. Lorn Campbell, Jr., now vice-president and general manager of the Harris Calorific Company, and incidentally founder of the United States Welding Company. At the time of the merger, the entire plant and a large portion of the personnel of the Minneapolis company were moved to Cleveland.

Prior to the merger the United States Welding Company had

Mr. Lorn Campbell, Jr.

brought forth the Automatic Welding Torches, the Gasaver, and a now widely used Line Regulator.

Mr. Campbell, the inventor of the Multi-Stage Regulator, who has been in charge of the engineering and laboratory activities, has had a colorful background, his research work having carried him into every state of the Union as well as to Europe and other foreign countries. In approaching his engineering problems he was very fortunate in having behind him a very wide practical knowledge of the welding and cutting art, which came about through the fact that he had been selected by the Ordnance Department during the War to establish schools and train welders in that branch of the service. Being a practical welder and to facilitate his teaching activities, he published a text book on welding, in addition to which he has contributed at various times rather extensively to the trade papers on technical subjects bearing on the industry.

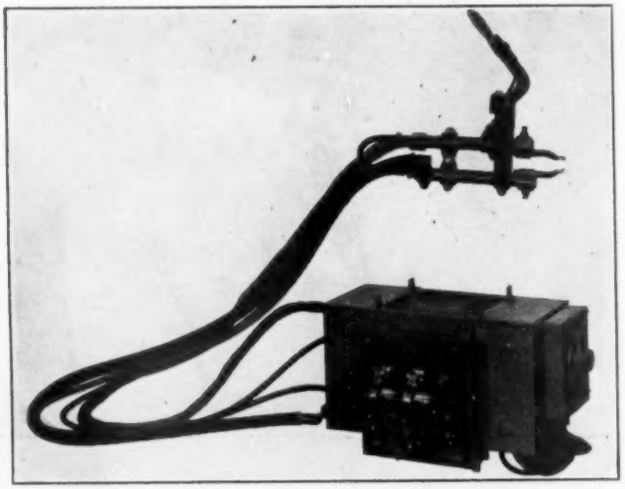
It has been the opinion of Mr. Campbell for some time that the regulator was one particular item utilized in the welding and cutting art which offered a field for improvement, and his company now offers the Multi-Stage Regulator. The work was hastened owing to the realization that the airplane industry was expanding and that every possible thing should be done by manufacturers of equipment to safeguard the welds and insure the best results in airplane construction.

A mental picture of the operation of the new regulator can be formed by imagining the use of two regulators "in series," one reducing the cylinder pressure to one hundred pounds and the

second reducing from that pressure to the working pressure. This is exactly what the multi-stage regulator does. Two diaphragms, two chambers, and two seats are enclosed in a single body. The first reducing stage is set at one hundred pounds and oxygen at that pressure is brought to the second stage of reduction, where it is reduced to the desired working pressure. The advantages claimed for it are more accurate control of working pressure and freedom from injury due to such causes as dust particles, turning on pressure with adjusting screw set at working pressure, etc.

NEW PORTABLE SPOT WELDER

The Thomson Electric Welding Co., Lynn, Mass., have recently announced a new 25 KW portable spot welder. The unit consists of 25 KW or 35 KVA transformer on which is mounted a magnetic wall switch and also a five point regulator switch which is connected to the tapped primary coil of the transformer for obtaining variation in welding voltage and current for different thicknesses of material. The unit is also provided with four ears to permit its being suspended from overhead if desired.



Thompson Portable Spot Welder

The unit may also be supplied mounted on casters or small wheels where it is desired to move it about the factory in this manner. To the cast water cooled terminals of the secondary are attached large extra flexible cables which terminate in a pair of hand operated pliers. The design of these pliers is such that various shaped welding electrodes may be attached or removed quickly. Pressure on the welding points is obtained through hand lever operating rack and pinion. Pliers may be built with various throat depths to accommodate the job in question. Pliers are water cooled. Control is through pushbutton switch mounted on the plier lever and connected to operating coil of the magnetic wall switch.

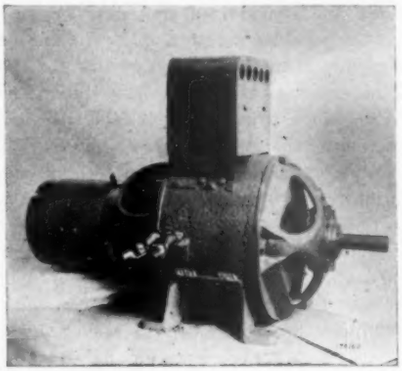
The transformer is designed to give the necessary high secondary or welding voltage which is necessary when using long length of flexible cable. Various lengths of flexible cable may be supplied up to ten or twelve feet according to requirements. The unit is particularly applicable to welding of light sheet metal parts which because of their shape or overall dimensions make it difficult to bring the work to the conventional type of permanently located spot welder. It should be particularly useful in welding operations on window frames, door frames, automobile body parts and the like.

WELDING GENERATOR FOR BELTED OR COUPLED SERVICE

The Westinghouse Electric and Manufacturing Company has recently added to its line of arc welding equipment a new design 200 ampere generator which is not provided with a driving unit. This is for use in isolated places where electric power is not available and where driving power such as gasoline engines, steam engines, lineshafting, tractors, etc., are already at hand.

The complete unit consists of special constant current type SK welding generator with coupled exciter overhung from the generator bracket, control panel and reactor. The reactor is mounted separately. The overall dimensions of the generator are a minimum so as to permit mounting the generators in the spaces allotted.

The generator is differentially compound wound and designed for a single operator. The constant current variable voltage



New Generator for Belted or Coupled Service

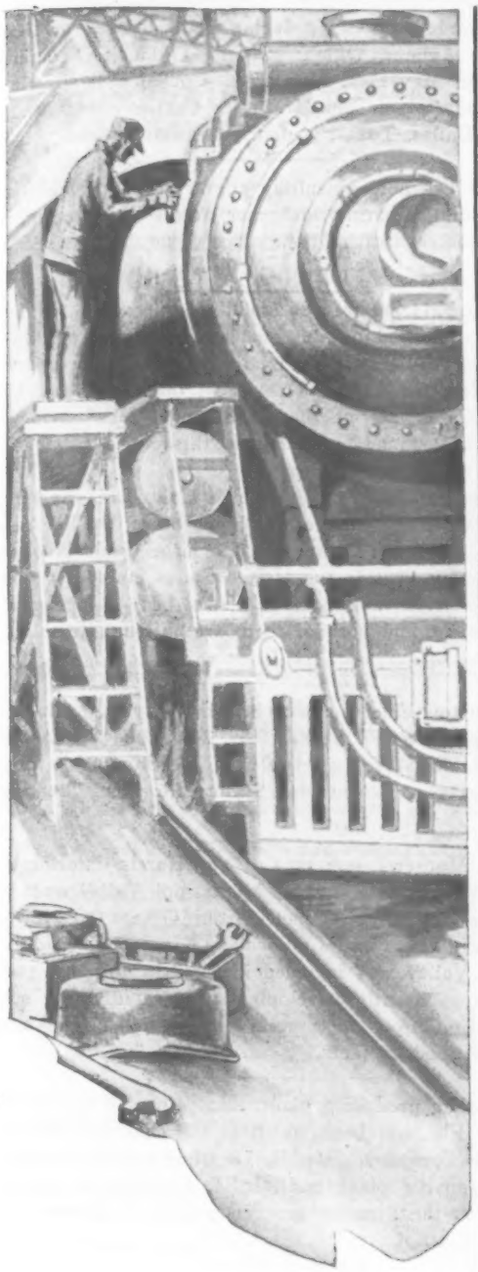
characteristics of the generator, together with the separately excited feature, insures a fast, steady and penetrating arc. Variations in arc length or intensity are automatically compensated for by instantaneous changes in the generator voltage.

The control for the generator is mounted on top of the generator frame and protected by a sheet metal cabinet. The control consists of a voltmeter, ammeter, and a single dial field rheostat for adjusting welding current over the entire current range.

The generator is rated in accordance with N. E. M. A. standards, 1 hour 50° C. rise on a resistance load at 25 volts. The generator has a welding range from 60 to 250 amperes and requires a driving unit whose maximum rating is: motor—10 hp.; lineshaft—15; gas engines, 20 hp.

BROOKS TWO WAY FEED GENERATOR

A folder has been received from the Brooks Machine Company, Wichita, Kansas, describing the application of the Brooks two-way feed acetylene generator. The working principle of this machine uses the gas pressure in the generator, as it passes from the generator chamber to the torch, to operate the feed direct. The feed consists of a bell chamber with an outlet pipe at the top. The chamber contains a bell connected to a feed rod which is also connected with the rotary feed wheel. As the gas passes from the bell chamber it operates the bell, which in turn operates the carbide feed wheel, gradually dropping the carbide into the water and giving a uniform gas pressure. A pipe extending from the shoulder of the generator is connected with the diaphragm bell and as this bell shows the slightest tendency to close, the flow of gas through the bell chamber is increased, thus increasing the feed. If the flow of gas through the bell chamber diminishes the feed of carbide diminishes. Thus the diaphragm bell regulates the flow of gas passing through both pipes at all times when the generator is in operation. When the torch is lighted the generator starts to operate and when the torch is turned out the operation ceases. The generator does not feed carbide or work at a higher pressure than that at which it is set. This eliminates the chance of the gas passing out through the release valve undetected and being wasted. The generator is equipped with a flash back safety valve and a low pressure safety valve, the seats of which are composition to the metal which it is stated cannot corrode or become fastened.



TOBIN BRONZE* WELDING FOR HEAVY REPAIR WORK

TOBIN BRONZE Welding is considered the best and most economical method for making a wide variety of repairs in the shops of one of the largest midwestern railroads. For more than eight years the road has employed this method of welding because of its economy of time and labor.

The extent to which Tobin Bronze Welding is used for heavy repair work on locomotives, tenders and cranes may be judged from the following typical examples—Repairing web and frame cracks in rotating bases and deck castings of derricks; welding cracks in derrick hoist clutch drums; building up main rods on locomotives; welding stud flanges on front end of locomotive cylinder, repairing brake cylinder heads; welding cracks on super-heater heads; plugging enlarged keyholes on collar boxes; replacing broken metal on base castings for turrets; sealing cracks in pumps; welding cylinder blocks for gas motor cars.

Throughout the country, Tobin Bronze Welding is being used for similar heavy repair work because of its high strength and dependability and because of the saving in time and labor it affords. Full information upon request.

*Trade Mark Reg. U.S. Pat. Off. and Canada.

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Canadian Mill: ANACONDA AMERICAN BRASS LTD.
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ANACONDA
WELDING RODS

ANACONDA
from mine to consumer

There is a suitable Anaconda Filler Rod for every welding purpose. The principal Anaconda Welding Rods, with their melting points, are listed below:

for oxy-acetylene welding

Tobin Bronze	1650°F
Manganese Bronze	1598°F
Brazing Metal	1634°F
Electrolytic Copper	1981°F
A. B. Naval	1625°F
Everdur	1866°F
Silicon Copper	1981°F

for arc welding

Phosphor Bronze	1922°F
Everdur	1866°F

FOLDER ON ARC WELDING

. The very wide range of uses of electric arc welding in the maintenance field is pictorially shown in the publication D. M. F. 5156 recently released by the Westinghouse Electric and Manufacturing Company. Because of the great interest shown in the fabrication of structures by arc welding, the original application of the electric arc has been somewhat overlooked. This folder entitled, Maintenance by the Electric Arc, is No. 7 of a series of direct mail folders on Arc Welding Data. Any of these may be had upon request.

METAL ELECTRODE HOLDER FOR ARC WELDING

The Westinghouse Electric and Manufacturing Company has recently announced a light, well balanced and durable metal electrode holder, which is capable of handling all commercial sizes of electrodes up to and including ¼ inch.

The jaws of the holder are made of pressed metal parts with a minimum distance between the lower jaw and the upper handle, permitting accessibility to work in crowded places. The jaws are constructed to grip the electrode in any position or angle. This holder is furnished with or without the five feet of flexible cable attached. The weight of the holder without the cable is approximately 18 ounces. The lower current carrying jaw is of sufficient cross section to carry a comparatively large current without overheating.

For light carbon electrode welding or cutting an adapter which handles ⅜ inch and ½ inch carbon rods can be furnished for use in conjunction with the metal electrode holder.

BENT PIPE AT LOW COST

On a good deal of plumbing and heating installation work there is a tremendous advantage in being able to substitute bent and welded pipe for cast elbows and other types of fittings. In addition to the lightness and tightness of the bend secured in this way there is often a distinct advantage in using a longer radius bend than can be accomplished with ordinary stock fittings. A complete line of equipment for bending pipe for this purpose is made by the American Pipe Bending Machine Company, 37 Pearl Street, Boston, Mass. One model called the "Wonder," bends wrought iron, steel, brass and copper pipe in diameters from ½ in. to 1¼ in., without cracking, crimping or flattening the pipe. A circular states that for refrigerator and electrical work the cost of making bends can be cut to a saving of 85 per cent. Hand power benders are made to accommodate pipe up to 8-in. diameters. The company also furnishes machines for bending tubing and solid bars.

"SUNRAY" WELDING FLUX FOR ALL METALS

The International Oxygen Company of Newark, N. J., has recently placed on the market "Sunray" a welding and brazing flux suitable for all metals, including aluminum, brass, bronze, copper, cast iron, malleable iron, monal metal, nickel, etc. It is also excellent for electric welding.

The put-up is a very attractive one, in one-pound non-spillable type cans. The item is being marketed through leading automotive supply houses and jobbers of welding supplies throughout the country.

NEWS OF THE WELDING TRADE

A new Linde oxygen producing plant located at 1000 W. Washington Avenue, Oklahoma City, Oklahoma, commenced operations on May 17th. Mr. F. K. Buckalew is superintendent of the new plant, and Mr. A. B. Curtis, whose headquarters are at Dallas, Texas, is district superintendent.

Ewertz & Dalcher, consulting engineers on problems relating to welding, marine and mechanical engineering, have announced the removal of their office to 26 Cortland St., New York.

Contract for 11,142 feet of installed pipe and 5,153 feet of 20-in. pipe additional on the Walla Walla job from the city reservoir has been let to the Beall Pipe & Tank corporation. The contract price on the 11,142 feet offered by Beall, was $35,538. This is one of the largest pipe jobs having been awarded to a Portland manufacturer this year.

Mr. Edward Favelle, of Favelle & Cole, Ltd., Sydney, N. S. W., was a recent visitor at the home office of The Welding Engineer. Mr. Favell's company is a large producer of welded tanks and his visit to the United States includes a number of inspection trips to important plants. He is accompanied by Mrs. Favelle, and both of them are enjoying their stay in this country.

J. B. Johnston, chief material branch, War Department Air Corps, Wright Field, Dayton, Ohio, was scheduled to discuss welding and aircraft metallurgy at a meeting of the Indianapolis chapter of the American Society for Steel Treating on May 13.

Mr. J. M. Mathews, secretary of The Harris Calorific Company, spent four weeks in the Mississippi Valley and West covering the company's agencies from Omaha to New Orleans, through Texas and California. A personal visit to the Rio Grande Valley was included in the trip and that portion of Texas is apparently developing very rapidly and advantageously. Conditions in general were found to be good—exceptionally good, in fact.

A new oxygen producing plant, located at 150 Stockton St., Jacksonville, Fla., has been added to the chain of The Linde Air Products Company. Mr. E. H. Blount is superintendent of the Jacksonville plant and Mr. J. Erskine, whose headquarters are at the Birmingham Linde plant, is district superintendent.

The Lincoln Electric Company, Cleveland, Ohio, manufacturers of "Stable-Arc" welders and "Linc-Weld" motors, announces the recent appointment of new district sales representatives. B. W. Brown has been advanced to district sales representative with headquarters at Milwaukee, Wis. G. O. Forseth, formerly a sales representative at Detroit, Michigan, has been promoted to district sales representative with headquarters at Minneapolis, Minn.

The Modern Engineering Company of Louisville, 1537 West Broadway, Louisville, Ky., headed by Max Abrams, have been appointed exclusive distributors for Louisville and surrounding territory, and the Sales Engineering Co., 1032 38th St., Milwaukee, under A. H. Friese, is exclusive Wisconsin distributors for the Meco Welding and Cutting apparatus, as manufactured by the Modern Engineering Company of St. Louis. These organizations specialize in welding supplies and each is headed by men who have had about ten years' experience in the welding industry, and therefore are in good position to handle this line to advantage.

Both companies are looking for live agents throughout their territories.

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Arc Welding Equipment
Sold and Rented
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Cost less to make Sell for less
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1" pipe, 5c 3" pipe, 20c
2" pipe, 10c 4" pipe, 40c
6" pipe, 60c to $1.00
8" pipe, $1.00 to $1.50

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Send for catalog. Over 7,000 in use.
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American Pipe Bending Machine Co., Inc.
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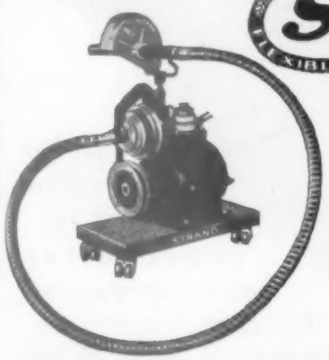
FLEXIBLE SHAFT GRINDERS
TYPE M 6 - ¼ H. P.

Strand
FLEXIBLE SHAFTS



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A worth-while proposition to supply dealers and manufacturers' representatives
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Classified Ads

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Jobs Wanted—4 lines free.
Other Ads—$1.00 per line, minimum 4 lines.
Counted 8 words to line. Add 6 words for keyed address.

Sales Correspondent—Excellent opportunity offered experienced man able to assist in sales correspondence of large manufacturer of welding rods and equipment. Must have electrical engineering education and knowledge of welding industry. State salary last received. Reply to Box 185, care The Welding Engineer.

Wanted—At once, welding dept. Shop foreman an expert on welding heavy plate. Advise experience, salary expected and furnish reference. Address Box 186, care The Welding Engineer.

Salesman Wanted—A patented device for the oxy-acetylene welding and cutting and the contracting trades has been developed; its sales possibilities demonstrated. It now requires larger sales organization; every oxy-acetylene user and contractor a prospect. Anyone interested address Box 188, care The Welding Engineer.

Wanted—Connection with some company for the distribution of full line of welding equipment in Oakland, California. Fourteen years experience as welder, welding supervisor and sales and service representative. Address Box 169, care The Welding Engineer.

Position Wanted—As welding instructor, preferably in high school or junior high school. Have had experience in one of the best welding schools in the country. Teach welding, metallography, metallurgical chemistry. Age 24. Married. Now employed. Can give satisfactory references. Address Box 187, care The Welding Engineer.

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—careful inspection of *each* cylinder, after *each* operation in the productive process—

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Results—

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Rep Flux will tin any metal but Aluminum — pre-heating unnecessary—only a small flame is needed.

Rep Flux will tin scored cylinders without removing block from chassis. Scores are then filled by applying Rep Rods by small welding flame.

Large returns for small investment.

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Pioneer Gas Manufacturers of the West

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ISCO AMERICAN SELECTED WALNUT SIZE CAUSTIC POTASH

Specially Prepared for Liquefaction Plants

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by using ISCO American Selected Walnut Size Caustic Potash, the cheapest form of Freeze-up insurance.

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Welding without guess work is made an accomplished fact with Torchweld welding torches because they operate with both needle valves wide open and the gases come to the torch at equal working pressure.

This method of torch operation, original with Torchweld, represents the best oxy-acetylene practice and assures you a soft neutral welding flame which will flow your metal and not blow it, eliminating all guess work in welding.

No other equipment gives you performance so constant, so lasting and so economical as Torchweld.

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TORCHWELD EQUIPMENT COMPANY
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Cutting 36-in. cast iron pipe 50 ft. below surface.

Electric Under-Water Metal Cutting Torch

For cutting steel plate, brass, copper, bronze, or any metal, under water. Removal of steel pile cofferdams. Repair or removal of cast-iron pipe line sections, etc. Apparatus and diver operators furnished on short notice.

Under-Water Metal Cutting Corp.
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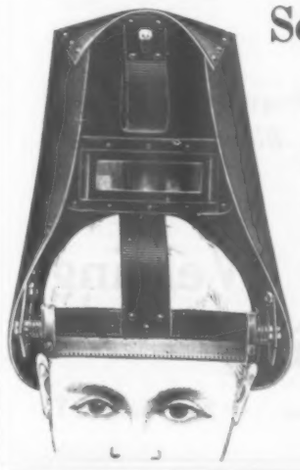


Sellstrom *Super-Service* Helmet and Handshield

Nos. 202, 203, and 172

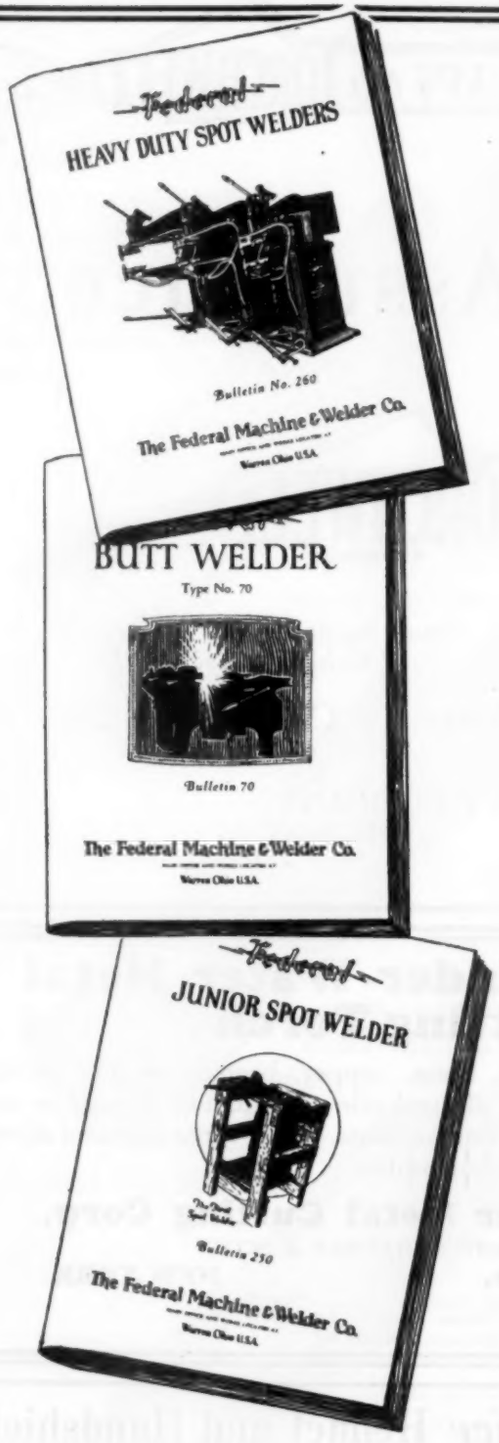
Until you have used a Sellstrom Super Service Helmet you don't know the comfort of wearing a helmet. A head shield helmet that is as nearly perfect as is possible to make anything. 100% increased wearing efficiency. 50% less lens replacement cost, and comfort beyond your ability to imagine, is what you get when you buy Sellstrom super-service helmets.

Efficient convenience of manipulation and full protection for the eyes are built into these light-weight fibre helmets. Sellstrom super-service helmets are designed to give security to the eye, to fit the head as comfortably as an old hat, and to eliminate as far as possible the breakage of expensive lenses. No welder will part with a super-service helmet when once he has worn one.

Sellstrom specially designed lens holder enables wearer to change lens or cover glass with minimum effort. All hazard of breaking costly welding lens when changing cover glass is completely eliminated in the Sellstrom Helmets. You simply press down on the spring catch and lift lens out with hand. Only a few seconds required.

When in the market for welding goggles, lens, helmets or handshields, write

SELLSTROM MFG. CO., 344 N. Ogden Ave., Chicago



We would be very glad to supply you with any of the above bulletins and if you have any other welding problems or would like any other information kindly get in touch with the Federal Machine and Welder Co., Warren, Ohio. We have engineers who would be very glad to go into your propositions thoroughly.

Federal

MACHINE & WELDER CO.
Dana Ave. Warren, Ohio

Arc Welding Handbook

BY C. J. HOLSLAG

A simple and practical manual of instruction in arc welding. The beginner is led step by step to complete mastery of the process. The supervisor is furnished a reliable guide for the training of new operators. The experienced operator is posted on principles which were overlooked in his first teaching.

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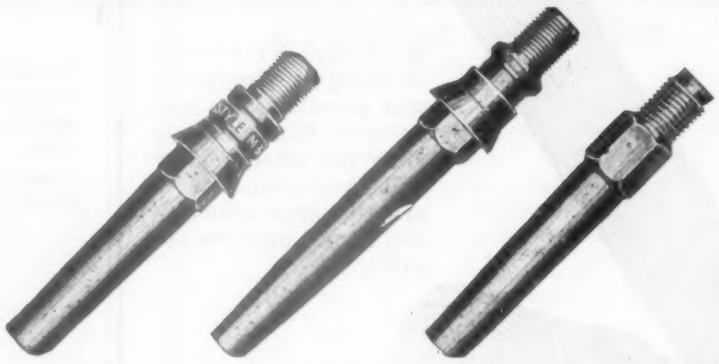

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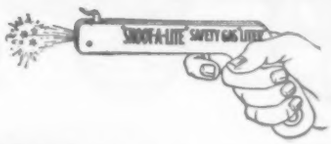

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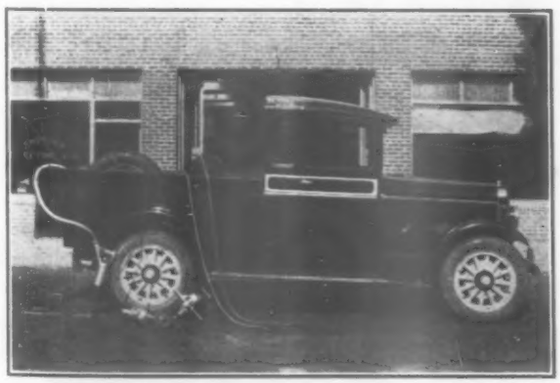

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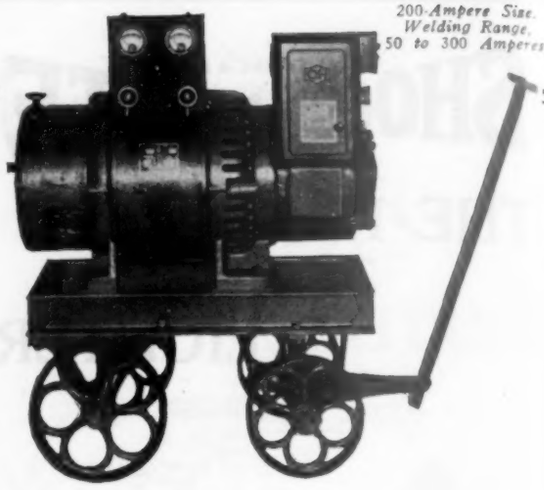

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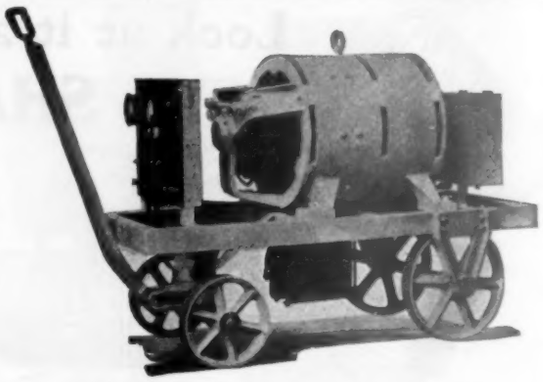

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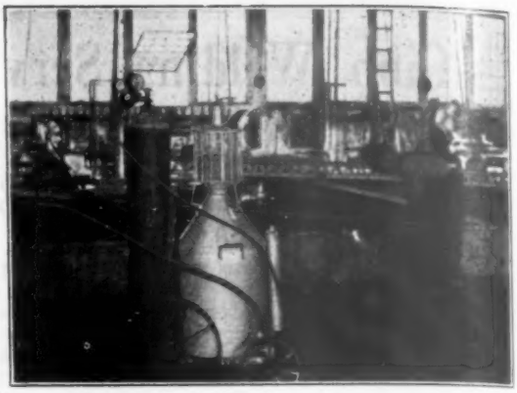

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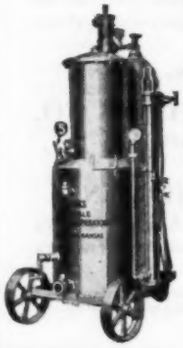

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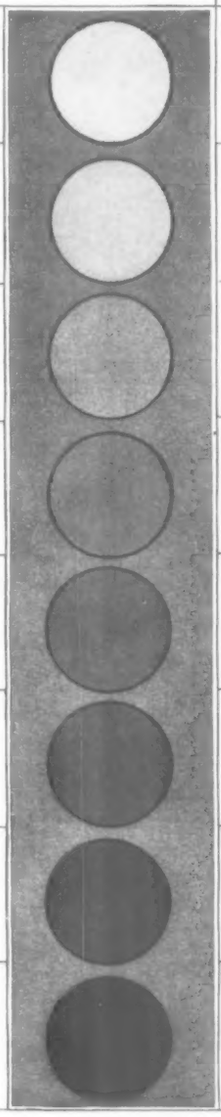
Shade No. 2		2.7 *per cent*	.5 *of one per cent*	40.3 *per cent*	Heating furnaces, welding observation, lead burning and other work involving low temperatures
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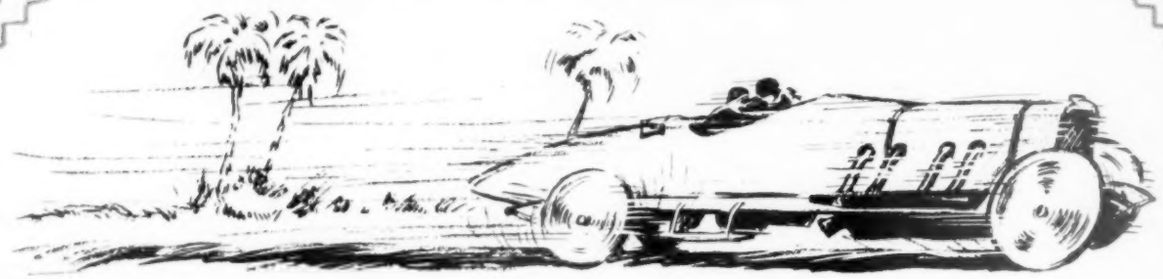

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